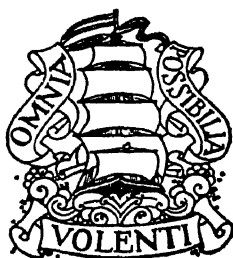# THE ART OF COLORING
PHOTOGRAPHIC PRINTS

IN TRANSPARENT WATER-COLOR, TEMPERA,
OPAQUE AND TRANSPARENT PASTEL, WAX
CRAYONS, OPAQUE AND TRANSPARENT OILS,
CHEMICAL COLORING, AND COLORING
LANTERN SLIDES

BY

J. CARROLL TOBIAS

I

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I

THE ART OF COLORING PHOTOGRAPHIC PRINTS

INTRODUCTORY

Up to a time not far removed a belief existed in the minds of many people that, to be of any utilitarian value, an article or commodity had to be severe, if not exactly unprepossessing, in appearance. This belief was a "hang-over" from the straight-laced, austere Puritan fathers who looked with disfavor upon any efforts of their flock to "dress up" either their personal appearance or the appearance of their homes. Out of such a concept grew the stiff, straight lines of colonial furniture, which, though pleasing to the eye and of strict utilitarian value, is, nevertheless, far from comfortable.

But times change. Today, and for some years past, we have been learning that even the most homely articles of everyday use can be given an added attractiveness and can be "dressed up" without in any way impairing their usefulness. Shapes, forms and materials have not changed noticeably. Knife handles, chopping bowls, rolling pins, cutting boards, etc., are still in the same form and are still serving the same useful purposes. Typewriters are still in use for typing strictly business letters, and cameras are taking pictures just as they have always done, but the outward appearance of these has been vastly improved. And by what medium? Why, *color!*

The ancients understood the manufacture and appli-

cation of color, and made use of it in the decoration of their homes, temples, statues, and public buildings. So enduring has some of this work been that portions of it are still in excellent state for our study. The study of color by the early mediaeval painters was beset with many difficulties, for they had to search and test and perform many experiments in their quest for colors that could be applied to their work.

Later came the invention of printing and for years, with few exceptions, we saw only black on the printed page. But black alone cannot fully express the charm of a lovely face or the brilliant colors of an autumn landscape. These require color for realistic portrayal, and the minds of men turned to the development of a means for injecting this vivifying element into printing. Today, in almost every magazine or printed piece of advertising we see page after page sparkling with color. The desire for color has also invaded the motion picture industry, where millions of dollars have been spent in developing colored pictures to their present state.

In all nature, color is the only thing that remains with us always. It is an integral part of everything. Forms, no matter how beautiful, crumble and lose line. Motion, even poetic, rhythmic motion, finally comes to rest. Sound, the soul-filling crescendo of the symphony, the ecstatic trill of the hermit thrush, becomes silent. Color alone abides. It may fade, as the resplendent hues of an autumnal sunset, the vivid splendor of the northern lights, or the spectral colors of the rainbow, but ever it repeats itself and lives again on some later day in all its glory. The rose need not be painted or the lily gilded. Nature, master colorist, has lavished her gifts and left nothing to be desired.

CHAPTER II

PHYSICAL REACTION TO COLOR

Color has power to cheer, to stimulate, to animate. It can soothe and rest us, or it can induce an emotion of depression and melancholy. When painting a picture, the mood of the artist is reflected in his work and can create a similar mood in the mind of the observer whose sensibilities are subject to suggestion. Judicious use of color can thus create in the beholder any reaction the artist desires. In the field of selling, the masterful use of color by an advertising artist can sway a nation of buyers by reacting upon their emotions through its psychological stimulus. Just as the toreador arouses the anger of a bull in the arena, first to a fighting mood, and then to a state of mental chaos where discretion vanishes and the animal dashes madly in pursuit, so do various colors react upon man whose primitive nature, beneath the thin veneer of civilization, is susceptible to color reaction. That susceptibility, whether its existence and effect are known to the beholder or not, exerts a powerful influence upon his mental processes.

Such impressions received from color have probably been the foundation upon which was built a color interpretation which lives today in its ancient form. For example, red is the sign of danger. It has the peculiar power of reacting upon the nervous system to arouse anger and create disquiet. Yellow abounds in sunshine, light and warmth, yet it typifies the coward. Blue is the

emblem of truth, loyalty and courage. It is a cool color of quiet dignity, and the direct opposite of red, for it is by nature soothing and restful. Orange, symbolic of rich harvests and plenty, reflects the abundance and completeness of life. Green expresses inexperience, freshness, adolescence and the rebirth of life according to the prophecy. Purple, secretive and mysterious, has long been consecrated to the church and royalty, probably because it is so rarely found in a pure state in nature. Black, the dread symbol of death with his scythe, carries a feeling of despair and utter despondency; while white, portrayer of simplicity and purity, is the emblem of innocence and chastity.

CHAPTER III

WHY DO WE USE COLOR?

According to a general belief, business men are distinctly commercial minded and must be assured of a definite return on any capital or effort expended on a venture. These men have given liberally of their time, money and effort to place before the public the results of their labor in the field of color research. The reaction of the public to the widespread use of color has been reflected in the increased sale of those articles to which color has been applied, or whose availability has been made known through the use of color in advertising. And for what reason? There are certain well-defined advantages in the use of color, which increase the value or aesthetic pleasure derived from an article.

Consideration of the foregoing effects of color reveals the following reasons for its application to photographs which are in the possession of everybody.

1. *To achieve realism.* — A photograph may be technically perfect. It may contain a wealth of tonal value. It may be beautifully lighted to give good perspective, atmosphere and modeling. But it lacks life and color. In short, it lacks realism.

2. *To focus attention upon a certain part or parts.* — Pictorial composition, be it in drawing, painting or photography, aims at one objective: focusing the attention of the beholder upon some particular spot in the view that attracted the maker's attention. To be a

successful piece of graphic art, the work must have on
central *motif* upon which the eye can rest and find quie
Pictorial photography attains this end through the jud
cious use of lights and shadows in which the colors o
nature have been translated into tones of grey. Th
artist-painter attains it by using the colors of natur
thereby securing realism and attention.

3. *To appeal to the emotions.* — Pictorial photog
raphy secures emotional appeal through a proper selec
tion of time and place, and by chemical or manual ma
nipulation of the camera product. Thus an impressio:
of gaiety is created by constricting the tonal scale fror
highest value to lowest value, thereby effecting shar
contrast between light and shadow. To induce in th
observer an impression of solitude, a photograph is pro
duced in which there are few lights of high tone-value
numerous areas of grey and balancing masses of darl
tones, but no heavy blacks. In other words, a " grey
day is usually conducive to a melancholy mood, so
" grey " photograph creates a similar emotion. The art
ist has at his command a palette of colors with which, if i
is his mood, he can see before him a subject which in it
natural aspect is light and airy, yet place upon his canvas
picture that will arouse an exactly contrary emotion
Just as music has power to excite emotions, so has colo

The Necessity of Color Perception

Now, that the reasons for color have been briefly described, let us turn our attention to the application of colors to photographic prints. Generally speaking, any photograph *can* be colored, but the success of the work is dependent upon several conditions. First of all, it is necessary that the colorist be possessed of a certain amount of color-sense. An old master was once asked, by an enthusiastic admirer, with what he mixed his colors to get such brilliant results, and his answer was, " With brains, Madam." Thanks to modern chemistry, we have at our command an almost unlimited array of colors, but colors cannot think. Upon our own mental activity and observation rests the success of our enterprise, and it can succeed only to the extent of the amount of thought we put into it.

There are so many elements entering into a successful picture that a volume the size of this could be filled with their description and analysis. That cannot be done in the space allotted to this phase of the work in this discussion, so only the most important phases will be taken up briefly.

Of major importance is the faculty of observation. A pupil of Da Vinci once asked him, " Sir, have you any objection to my painting nature as I see it? " To this the master replied, " No, provided you do not see nature as you paint it." That reply may seem paradoxical,

yet upon analysis it is seen to contain the essence of all observation. The psychological effect of observation is peculiar, for unless we are trained, either through our own efforts or those of others, to actually *see* things, we go through life missing much that is beautiful, and at the same time amassing erroneous conclusions. Association of ideas plays a very important part in observation, and it plays a double rôle, which may react either for us or against us. Suppose we are walking through a rather dense woodland into which the sun breaks only through chinks in the trees. We are walking in a sort of twilight, pleasant and cool on a warm summer day. Now, what produces this twilight? Shadows, of course. But what is the color of the shadows? They are dark, you say. Quite true, they *are* dark, but darkness and light are comparative terms which are susceptible of varied interpretation. And it is in this interpretation that association of ideas as applied to observation is important. To the untrained observer the suggestion of darkness brings to mind tones of grey, possibly running to black.

Few people realize by what numerous color combinations grey can be produced. When they think of grey they immediately associate black and white. True, for purposes of painting these two pigments can be combined to produce grey, but not in nature. For in nature there is no black, except the blackness resulting from the total exclusion of all light. Therefore, black is not a color; it is the absence of color, since color can exist only where there is light. Also, in nature there is no white, except the whiteness of newly fallen snow, which, strictly speaking, is not white to one trained to see color, for it reflects the color of the sky and its surroundings. If, in painting snow, it were represented by pure white

pigment, it would look like so much chalk, even to a person with no keen color perception. So, with these two pigments eliminated from nature's palette, it will be impossible to produce grey by their admixture.

With black-and-white grey out of the reckoning, observation must be turned into other channels to learn what " darkness " produces the shadows in our mythical forest. Greys may very well be present, but if they are, then they must, perforce, be composed of color. Thus a point is approached where association of ideas is of benefit. Perhaps we have seen a painting of a similar subject wherein the shadows were luminous with blues, violets, greens and purples, and perhaps we thought such colors would never be found in nature. We look about us, by association we recall those colors, and are surprised to find them just as painted. Hola! We have discovered something. We are learning to see. We are associating ideas, and out of a chaos represented by no observation we bring order through intelligent observation. Truly, " seeing is believing," for whereas we doubted the existence of color in shadow we now see and believe. We are observing; that is, we are seeing intelligently, with eyes open, as it were, and are making mental notes of what we see. After all, observation is nothing more than the physical reaction of sight made intelligible through the combination of mental impression and analysis. The faculty can be cultivated, strengthened, and made a most valuable working accessory, so that every effort should be made to develop it to the utmost.

Theory and Development of Color

Thus far, nothing has been said of the nature of color; what it is or how it is produced. It is really surprising, even in this age of color through which we are passing, to note the large number of people who have no appreciation of the color existing in all objects in nature. They can see the brilliant hues of flowers, the full greens of trees and grass, the deep blue of the ocean and the azure of a summer sky. These are quite evident, but ask them to distinguish between the green of an elm and that of a willow, or ask them to point out the difference in color from horizon to zenith. If they were shown a piece of coal or an old rusty horse shoe or common street mud, persons uneducated in art and color would immediately pronounce them black or grey and entirely devoid of color. As a matter of fact, this is not true, for if these objects are in light then they are possessed of color.

Color perception, like observation, is purely a matter of cultivation. The ability to distinguish between the bright colors, blue, green, red, yellow, etc., is acquired at an early age, like speaking and reading. But there color perception often stops. Everyone, except the color-blind, can readily distinguish between bright green and bright blue, but very few are able to distinguish between a blue-green and a green-blue. Green is composed of blue and yellow and so will change in hue ac-

cording to the amount of each primary color present in the mixture. Theoretically a proper mixture will produce a pure green; an excess of blue will make a blue-green; an excess of yellow will make a yellow-green. Of course it is not to be assumed that these few tones are the only greens obtainable, for that is certainly not true. This case was chosen simply as an illustration to show how slight differences must be studied and the eye trained to observe them.

There is a relation between light and shade that very materially affects color, since color is a sensation resulting from certain conditions of light and, divorced from those conditions, has no existence. Suppose a room containing a bright green vase. As long as that room is illuminated with white light, no matter how slightly, the vase will still be green. Plunge the room into total darkness and the vase will disappear. Yet its color has not changed. It is still green, but cannot be seen in the darkness because there is no light for it to reflect, hence there is no sensation of color. Frequent reference is made to certain words when speaking of color and it will be well to define these now for a full understanding of their meaning.

SHADE — This word is used in a double sense in art. 1. A *shade* is the result of varying amounts of light falling upon different faces of a subject. If an object is evenly illuminated from three sides there will be no *shade* side visible to the observer. But if the light comes from one direction only then there will be two sides *in shade*. 2. A *shade* is the result of varying the tone of a color by adding to it another color to make it darker. This is called a *shade* of a color, and lowers its key.

TINT — When a color is made lighter by the addition

of another color the result is called a *tint* of the first color, and is of higher key.

TONE — Change of *tone* is effected by adding one color to another to make it lighter or darker. Suppose a grey composed of emeraude green and Chinese vermilion. It is desired to make it darker, so ivory black is added, thereby lowering the *tone* to produce a *shade*. If zinc white were used, the *tone* would be raised to produce a *tint*.

HUE — The variation in a color by the addition of a small amount of another color, usually a primary. Green is a secondary color resulting from the combination of two primaries; one warm, the other cool. So green may be made either warm or cool according to the amount of yellow (warm) and blue (cool) present. This change in feeling caused by the addition of one or the other constituents is called a change in *hue*.

KEY — The *key* of a picture expresses its relative light value. Pictures in *high key* have very few shades and shadows and these very light in value. *Low key* pictures are exactly the opposite, with few lights and numerous heavy darks.

SHADOW — Most objects in nature cast *shadows*. Perhaps such animals as the jelly-fish might not obstruct enough light to produce a shadow, but practically all objects will. A *shadow* results when the free passage of light is obstructed. The obstruction need not be opaque, for glass is not opaque, yet it will cast a shadow.

VALUE — *Value* is the term applied to the relative amount of light reflected by any colors, the strong values being those that approach white on one side and black on the other. A subject may have several tones of color, some in the light and some in the shaded portion. The

highlight is then the strongest *value* in the light side and the black the strongest *value* in the shade side. When painting a picture these *values* must be carefully studied and approximated in paint for proper presentation of the subject.

The study of values is most important to colorists, especially if they plan to do work in opaque color, where the original photographic image is covered with pigment. Then objects must be painted in their correct value or the perspective will be totally destroyed. But more of this later.

CONTRAST — This is the term applied to the effect produced when two or more colors, or different tones of the same color, are placed side by side. Four kinds of contrast are recognized in art — *contrast of tone, contrast of hue, contrast of tone and hue,* and *simultaneous contrast.* Thus the combination of a tint and a shade of the same color will produce a *contrast of tone.* A combination of two distinct colors of the same tone will produce a *contrast of hue.* A combination of opposite colors, one dark and one light, will produce *contrast of both tone and hue.* In actual colors this might work out as follows:

Case 1. *Contrast of tone.* Base color, orange. Red is added to lower the key or make a shade, and white is added to raise the key or make a tint.

Case 2. *Contrast of hue.* Base color, blue. Yellow is added to produce yellow-green; red and white are added to produce lavender. Both colors must be of equal value.

Case 3. *Contrast of tone and hue.* Two distinct colors are used, yellow and purple. They need not be of equal value. This contrast is analogous to the

contrast between the black shadows and white lights in photography.

Simultaneous contrast results when colors of different natures are placed next to one another, in which case they have the power of affecting each other with their complementary colors. Thus, when red and green are placed together they each appear more intense. (In landscape painting this phenomenon is often taken advantage of to intensify a color, say that of a red barn by painting green trees back of it.) When a neutral color (grey) is surrounded by a positive color, the neutral appears to be tinged with the complementary color of the positive. If a ring of grey be painted on a piece of white paper and this surrounded by a strong red, the grey will appear to be tinged with green, the complementary of red.

It will be a very useful exercise for the colorist if he observes this effect of simultaneous contrast by preparing a study plate as follows. On a sheet of Whatman's cold-pressed water-color paper lay out in light pencil lines four squares about three and one-half inches on a side, leaving about one inch between them. Now with positive colors, as strong as they can be made with the color at hand, paint in these squares with flat washes of red, violet, green and yellow. On another sheet of paper lay out four rings by drawing two concentric circles of two and one-half and one and one-quarter inches diameter respectively. Paint in these rings with a flat wash of medium grey made with dilute drawing ink. When these are dry, cut them out and paste in the center of the squares, one on each. The effect of simultaneous contrast may not be strikingly apparent at first, but if the squares are examined in subdued light, or if a piece of tissue paper be placed over them, the effect will at

once become apparent. The circle on the red square will appear greenish, the complementary of red; the circle on the green square will appear tinged with red; that on the violet square will appear yellowish, while the one on the yellow square will have a purple or violet cast.

LOCAL COLOR — This term is applied to denote the general color of a subject, without reference to the accidental effect of light and shade, distance, or reflection of other colors. Thus, the foliage of a tree is green in its local color, but in the yellow light of sunset it may be a golden brown, distance may impart to it a bluish tinge, or atmospheric conditions may render it a neutral grey. So we see that the apparent color is not always what the local color would indicate.

This in general covers the more commonly used color terms, except that the meaning of primary, secondary, tertiary and complementary colors has not been defined, nor has the general theory of color been explained, so before proceeding to the discussion of color application it will be well to discuss color theory briefly.

THE SPECTRUM — White light is often said to be composed of six colors, viz., violet, blue, green, yellow, orange and red. These colors can be produced visibly by passing a beam of white light through a triangular piece of glass known as a prism, or they may be seen in the rainbow. The proportion of each color present varies in different lights. Sunlight, gaslight and electric light each produce a somewhat different spectrum, but the proportionate quantity of each color is constant for a given light. It has been found that several of these spectrum colors can be matched in pigments by mixing pigments corresponding to others of them. A

mixture of red and blue pigments makes violet, yellow and blue make green, and red and yellow make orange. If these mixed colors be eliminated, the number of colors is reduced to three, red, yellow and blue. These are called the primary colors, since they are the bases from which all other colors, shades and tints can theoretically be made. The primary colors cannot be divided to produce any others.

For general purposes of color study in art the absorption theory will cover all requirements. This theory states that when a sensation of color is perceived, the object producing the effect is absorbing all colors except the one seen, which is reflected to the eye. If a surface be covered with pure yellow paint, that surface is then absorbing all the blue and red of the spectrum, and is reflecting to the eye only the yellow component of white light. If the surface be green, then it is absorbing only the spectrum red, while the blue and yellow are reflected to produce the sensation of green.

Examination of reproduced spectrographs, which may be found in any good encyclopedia or dictionary, will reveal that the colors violet, green and orange occur between the bands of blue, yellow and red, from which it can be assumed that these colors result from the overlapping of the primaries.

SECONDARY COLORS — The three colors just mentioned as being each composed of two primaries, violet, green and orange, vary in hue according to the amount of each primary present in the mixture, so that we can produce a red-orange or a yellow-orange, a blue-green or a yellow-green, a red-violet or a blue-violet. In this respect the secondaries differ from the primaries, which are theoretically standard and never vary.

TERTIARY COLORS — These colors are produced by the admixture of two secondaries, so that in a tertiary color four units of primary color are present. This may seem a trifle involved, inasmuch as there are but three primaries, but the explanation lies in the fact that one primary is present twice, or in other words, exists in a greater quantity than either of the other two. If green and orange are mixed the resulting color will be brown. Green is composed of blue and yellow, while orange is composed of red and yellow. Therefore we have in brown one part each of red and blue and two parts of yellow. Whereas primary colors are standard and secondary colors vary only to a limited extent, tertiary colors can be almost any hue, shade or tint.

COMPLEMENTARY COLORS are those colors which, by their union, will theoretically produce white, or, in practice, neutral greys. Although it is impossible to produce a pure white by any mixture of pigments, it is possible to produce a sort of dingy neutral grey, by mixture of all the spectrum colors, either individually or through the secondaries. The secondary colors are the complementaries of the primaries. The complementary color of any primary will be the secondary that contains the other two primaries, green being the complementary of red, orange of blue, and violet of yellow.

As the red pigment tends toward yellow, thereby becoming slightly orange, green, its complementary color, must be made bluer to properly compensate. If the red leans toward blue, its complementary color, green, must take on more yellow to offset the blue added to the red, since there is already sufficient blue in the green to neutralize pure red. Thus it is with all other colors and their opposites. In this way the complementary of any color

can be obtained with sufficient accuracy for all practical purposes in painting.

Brief as it is, this discussion of color theory and definition of color terms will provide the amateur colorist with sufficient information so that he need not proceed blindly with his initial work. The scope of this treatise is too limited to permit a full development of the theory of spectral color, and it is unnecessary in handling the use of pigments.

CHAPTER VI

THE PRINT TO BE COLORED

First of all we must decide upon what material our photographic print is to be made, the number of suitable supports being legion. The print may be made on paper, which is the most common support, linen, canvas, wood, ivory, glass, metal or practically any support that may suggest itself. The photographer who does his own work will have no serious trouble with this problem, for he has enlarging equipment at his disposal and is familiar with the manipulation of photographic chemicals. Perhaps he has already experimented with photographic prints on materials other than paper, and so can select a print support that will best conform to his esthetic tastes or requirements. For the benefit of those who have never attempted the fascinating operation of making their own positive printing material, a few formulas are included. This treatise, however, is not primarily intended to deal with home-made paper, so too much space cannot be devoted to the subject here.

There is a distinct advantage in making one's own printing material, for the colorist can then select from a large number of paper stocks one or more that suit his fancy. There are available for this use the very fine line of Whatman water-color papers, made in a variety of sizes and weights, the Strathmore line of water-color and charcoal papers, the numerous French, Japanese, Italian and other imported papers, and various domestic

brands in plate, laid and antique finish. Any local printer can show sample books of easily obtainable papers, while dealers in artists' materials will gladly supply the finer papers. Various photographic text-books also give formulas for coating canvas, linen, silk, wood, etc., so that they can be printed upon and later colored. Of course it is not really necessary for one to do all this dabbling around with home-made materials, even though he does want his prints on materials other than paper. There is at least one firm in New York which specializes in enlarging negatives on canvas, and perhaps on other materials, so if the colorist wishes to try work on such a base he can buy his prints already made, stretched and ready to paint. Also, there are several manufacturers of photographic materials now making art printing papers, ready sensitized, that offer a fine variety of surfaces and should provide a distinct appeal to those in search of something different. Sensitized canvas and linen for enlarging are also commercially available.

It is not the purpose of this treatise to go into the technicalities of sensitizing papers, so with just one or two paragraphs on that subject, for those who want to try it, we will pass over the matter.

From AMERICAN PHOTOGRAPHY, February, 1922, page 118, is quoted the following on home-made papers:

" R. Namias gives the following methods for preparing salted papers which, as the solutions can be applied to almost any paper, may be useful:

Gelatine	25	g	192	gr.
Zinc chloride, cryst.	6	g	46	gr.
Citric acid	5	g	38	gr.
Ammonia	6	ccm	46	min.
Distilled water to	1000	ccm	16	oz.

The gelatine should be soaked in half the water, the excess of water poured away and the gelatine melted on a water bath. Dissolve the citric acid in half the water, add the ammonia and then the zinc chloride, finally add the gelatine and filter after making up to the bulk called for.

" Tartaric acid may replace the citric, and then darker browns are obtained. The paper should be immersed in the warm solution and hung up to dry. It is sensitized with the aid of a flat brush and either of the following baths may be used:

Silver nitrate	12	g	115	gr.
Citric acid	5	g	48	gr.
Glycerine	5	ccm	36	min.
Distilled water to	100	ccm	2	oz.

or

Silver nitrate	12	g	230	gr.
Ammonia	q. s.		q. s.	
Distilled water to	50	ccm	2	oz.

Enough ammonia must be added to form a clear solution. Then add:

Lactic acid, pure syrupy	5	ccm	48	min.
Distilled water to	100	ccm	2	oz.

This will keep indefinitely in the dark, but the printing is rather slow; greater contrasts can be secured by the addition of 1 to 2 ccm of a 5 per cent solution of potassium bichromate. A more rapid paper is obtained with the following:

Silver nitrate	10	g	96	gr.
Uranium nitrate	5	g	48	gr.
Lactic acid	5	ccm	48	min.
Distilled water to	100	ccm	2	oz.

" The following gives sepia tones, but the stock solution will not keep:

Ammonia-citrate of iron, green	20 g	192 gr.
Potassium bichromate, 5% sol.	5 ccm	48 min.
Distilled water	50 ccm	1 oz.
Silver nitrate	10 g	96 gr.
Distilled water to	100 ccm	2 oz.

Dissolve the silver in a little water, add it to the other ingredients in solution, and make the bulk up to 100 ccm (or 2 oz.). After printing, this paper should be immersed in a 1 per cent solution of oxalic acid, then washed and fixed in a 2 per cent hypo bath.

" A casein paper is made as follows:

Ammonium chloride	4 g	31 gr.
Sodium citrate, neutral	4 g	31 gr.
Water to	40 ccm	6½ oz.

Dissolve and add:

Casein	4 g	31 gr.

Then add:

Ammonia	5 ccm	38 min.
Water to	35 ccm	5½ oz.

And finally add:

Silver nitrate.............	7 g	53 gr.
Distilled water	20 ccm	3½ oz.

This paper will not keep well, but can be made more stable by immersion in a 3 per cent solution of citric acid."

Coating must be done with brushes which do not have metal bindings, and is sometimes done by floating the paper on the surface of the solution.

Care should be taken to keep the solution from the fingers or from spattering on the clothes, as indelible

stains are formed on exposure to light. The coating must, of course, be done in the dark, i.e. out of daylight. Artificial light will do. Rinse the fingers carefully before going out into daylight. These stains on the fingers can sometimes be removed by chloride of lime, 350 grains, sulphate of sodium, 1 ounce, and water, 4 ounces. Apply vigorously with a small scrubbing brush.

As stated above, the selection of ready-made papers is very large, but a very satisfactory one for making prints intended to be colored is Defender Velour Black, which is available in white matt, cream matt and silk finish. Because of its rich emulsion, this paper has a very long scale of tones that range from white paper in the lights, through beautiful middle tones to deep rich shadows. It has a medium fast emulsion, coated on double-weight stock that takes water-colors, oil-colors, or any of the other mediums splendidly. Its ability to produce a full scale of tones will be found of extreme value for working in transparent water-colors.

If the colorist desires a paper approximating the Whatman rough water-color paper, this surface may be found in Wellington Cream Crayon Extra Rough. This is coated with a rich soft-working emulsion on an india-tinted stock that is quite absorbent of color. For this reason, be warned here that if this paper be used for water-coloring, or for any coloring where thin liquid colors are used, great care should be taken to apply the color only in very dilute washes and build up strength of color by repeated applications. It is very easy to overcolor on this material and once the color is applied it is difficult to remove. However, when used with intelligence the paper is capable of beautiful results.

Much of the effectiveness of the final result depends

upon the character of the black-and-white print. Modification of this by the use of various papers will make a material difference in the final picture. Try printing the negative on different papers and note the results. Some study and experimenting will no doubt be required to select the grade and surface that best suits the subject, but if the worker is striving for the best he can produce, this period of experimentation will be of enormous benefit to him.

Enough of papers. The next consideration is the type of print best suited to coloring. Only one general rule can be made to cover this, and that is, *hold the print light in tone.* Remember that transparent colors are to be applied to a surface already charged with pigment — the silver in the print. If the print be fully exposed and developed, the blacks will be too dark to reflect the color that is applied to them and will consequently lack luminosity. Even the middle tones will be too heavy to do full justice to the color film and the result will be unpleasant. To avoid this, hold the print slightly light · by shortening the exposure slightly, and developing fully to get a full range of tones represented by completely reduced silver. Do not underdevelop a fully timed print and attempt to secure the lighter tone in this manner, for such practice results in degraded color in the silver image and a print lacking in gradation.

As to the subjects best suited to coloring, the selection must be left entirely to the colorist. Marines, open landscapes, water scenes with interesting skies, such as cloud-filled sunsets, and some outdoor portraits are perhaps the best subjects, but generally, anything can be colored. In fact the most hopeless-looking subject can sometimes be transformed into a picture of real charm if properly

colored.   There is at present a popular demand for colored portraits and some very admirable work has been done on these.   Of course, most of this work is done by skilled artists, but skill is nothing more than continued practice and intelligent application.

THE DISTINCTION BETWEEN COLORING AND TINTING

One of the most common errors into which the beginner in coloring falls is that of destroying the tone values of his picture. This can very easily be done by using a tone too strong for the area being colored. The part which receives a color that is too strong is given undue prominence and the result is a destruction of values and perspective.

It will be noticed that throughout this discourse the application of color to a photographic print has been consistently referred to as *coloring* and not tinting. The reason for this is that colors in the true sense of the word are meant, and not the weak, washed-out tints so commonly seen on photographs. Beginners are so fearful of overcoloring that they nearly always go to the other extreme and undercolor. This can result in only one thing, a weak, washed-out product, lacking brilliance and depth, that is a full confession of our desire to do something without knowing how it should be done or how to do it. Far better to overcolor on one print and then correct it on another, than to turn out some of the atrocities so frequently offered for sale by art (?) shops.

The water-color artist beginning work on a picture starts with a blank piece of paper and by laying on appropriate colors and tones of colors secures a variety of effects. He gets brilliance by using pure colors of

tangible strength. He gets vibration by laying contrasting colors side by side. He gets perspective by placing proper colors in their proper places, all with only the merest outlines of his subject. Perhaps we have heard it said that the colorist working on a photographic image cannot secure these results because of the monochromatic silver deposit over which he is working. But the truth of the matter is that the general public has had foisted upon it so many examples of the " washed-out " type of tinting that it has come to accept such work as the best that can be done. On the contrary, intelligent work with proper colors can produce on a photograph nearly as great brilliance, contrast and tone value as an original painting on white paper presents. The public must be educated to this type of work exactly as it needed to be educated to the type of negative resulting from the use of color filters on panchromatic emulsions. Blue skies had been rendered in white, green trees, yellow flowers and mahogany furniture in black, for so long that when these were reproduced in their correct luminous value the public held up its hands in horror and said " terrible." Now, however, the public is awakening and is demanding that photographers use panchromatic materials. Just so, if colors of brilliance and strength were used on photographs, and used with artistic judgment, it would be possible to create a demand for this type of work. However, to repeat a former statement, strong colors must be used with judgment and some sense of artistic value, else the result will be abhorrent. And it is for just that reason that more strongly-colored photographs are not seen. As stated in the advertisements of photocolors, anyone, with no previous training, can *tint* photographs. Quite true, anyone *can* tint photographs, and

without any knowledge of colors; but not anyone can *color* photographs without some study and thought.

So much for introduction. The reasons for coloring have been given, the line between coloring and tinting has been drawn, the fact that photographs can be colored to nearly the same brilliance as an original painting has been pointed out, and the type of print best suited to coloring has been described, so now let us proceed to the actual work of coloring prints.

There is still a great demand for the tinted photograph and it is the easiest type of work to produce. Also, for those more seriously interested in the further pursuit of coloring it will afford some preliminary training and act as a stepping stone to future work. Therefore, the following discussion will be devoted to the materials required for tinting and the methods of application.

CHAPTER VIII

THE TINTING COLOR AND ITS APPLICATION

Three major items are required: a print to color, colors of some sort, and a selection of brushes. The attention of most persons will probably turn first to water-colors as a medium, and there are on the market several brands of water-colors that can be used for tinting photographs. Generally, tinting consists in staining the emulsion of the print with water-soluble aniline dyes, the depth of tint depending upon the strength of dye used. The regular artists' water-colors are not adapted to this work, except in a few cases, for the pigment contained in these colors is not water-soluble. Water is used as a painting medium, but its purpose is purely that of a vehicle to carry the color. Some of these artists' colors are even opaque, especially those pigments composed of natural earths, such as the umbers, the siennas, the ochres, and some of the reds. In these the tinting effect is secured by finely divided particles of color lying close together or widely separated, according to the amount of water used in painting. On the other hand, some of those colors that are composed of pigments resulting from certain chemical reactions, such as the lakes, chromes and madders, are more or less water-soluble and can be used for tinting photoprints, when made up into dilute washes by solution in water. Enough water must be used to make a thin, transparent wash, the character and suitability of which can best be determined by

actual experiment on an old print. Most of these colors, however, are prepared with alumina for painting only on white, absorbent paper, and when used on photographs have a tendency to leave a sharp edge of deeper tint at the boundaries of the wash. This is difficult for the beginner to remove by blending into the adjoining area, so these colors should be avoided until some color-experience has been acquired.

For general all-around work there come to mind the brand names of two water-colors that are prepared especially for working on photographs. These are the Japanese transparent water-colors and the Velox transparent water-colors. They are types of the aniline dyes mentioned above, are supplied in forms convenient and economical to use, and are thoroughly reliable, giving very satisfactory results in both strong and weak washes. These are obtainable from any photographic supply dealer in complete sets fitted with brushes and spaces for mixing colors, or separate sheets of dye may be purchased in a variety of colors. For use the colors are simply dissolved in sufficient water to produce the tinting strength desired, and are then applied to the print.

Actual application of the wash is effected with brushes varying in size according to the surface being covered, large brushes for large areas, small brushes for details. Some colorists advocate working on a dampened print and this practice may or may not be of assistance. The worker can determine in a few experiments whether or not he prefers a damp surface to work upon, and can then follow his own inclinations. A damp print has a slight advantage in that it permits, perhaps, a smoother blending of color than a dry surface, but if the washes are kept damp and the work rapidly executed, the same

effect may be secured on a dry print. If the print is dampened it should be thrown into a tray of clear water and left there until it is thoroughly soaked. It may then be removed, the surplus water drained off, and any pools that may collect removed with blotters, lint-free linen or absorbent cotton. During the process of tinting, the print may be laid upon damp blotters, and if the surface starts to dry the print may be dampened from the back. But be very careful, for the moist color is easily washed out of the emulsion.

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CHAPTER IX

CARE OF BRUSHES

Before going any further, just a word about brushes. These are important, especially if much work is contemplated. The brushes that are supplied with the sets of water-colors mentioned above are not of the best quality. If such a set is purchased, it would certainly be advisable to invest at once in a few better brushes. Red sable brushes are the best obtainable for water-coloring, but camel's hair may be used, if it is undesirable to make the outlay for sables, which are more expensive. For pleasant working, a springy brush that retains its shape well is the best to use, and this requirement is admirably met by sables. Large washes of a light tint for an even tone may well be applied with camel's hair brushes of the large sizes, but for small details sable brushes with fine points are to be preferred. These need not be small, in fact, a large, well-made brush that will retain a good point is preferable to a small one, for more color can be carried in it and faster work done. Most beginners make the mistake of selecting brushes that are too small. This slows up the work and prevents proper blending because of an insufficiency of water. So, if the most satisfaction and pleasure are to be derived from the work from the start, invest in at least two *good* brushes. In the class of good brushes one brand stands out clearly — the " Fielding " red sable brushes made by F. Weber Co. of Philadelphia. Any work that the beginner is

apt to undertake can easily be done with two brushes, namely, the No. 6 for large areas and the No. 0 for small details. These two tools will cost nearly a dollar, but they are so well made that with proper care they should last for years and retain all of their excellent quality. The writer has one of these brushes that has been in constant use nearly every day for the last four years and is still in as perfect working condition as it was when new.

Just a moment to digress here and enlarge upon the care of brushes. Every one who works with tools and derives any satisfaction from their use has a few definite rules that he follows to keep them in the best possible working condition. The most important tools used by artists are their brushes, and they are very careful to keep these in good order. Brushes require very little attention and the rules for this might best be stated by " don'ts."

Don't let your brushes dry charged with color.

Don't, when cleaning brushes, separate the hairs by pushing them against the bottom of the cleaning vessel. This destroys the shape and makes the brush straggly. If the color sticks tenaciously to the hairs and cannot be freed by vigorous swishing about in a large vessel of water, use a little Ivory soap, rub the brush broadside in the palm and coax the color out gently.

Don't squeeze surplus cleaning solution or color out of a round, finely-pointed sable brush. This practice, several times repeated, is apt to destroy the shape. It will do no harm to flat brushes, but is really not necessary. When the brush is clean, simply dip it into clear water, let it form its natural point, assisted, if necessary, by gentle stroking on the side of the vessel, and stand

vertical, resting on the handle end, to dry. The best way to dry brushes is to stand them on end in a jar or glass shallow enough so that the hairs are above the rim and do not touch the glass, but deep enough to prevent them falling out.

These simple rules faithfully followed will keep a good brush in perfect condition indefinitely and good brushes deserve this care.

CHAPTER X

THE NECESSARY COLORS

Unfortunately for the beginner in photo-coloring, he does not have at his command the wide selection of colors offered to the artist, for the small-edition sets of color films mentioned by brand name earlier in this treatise contain but a limited number of colors. However, the palette can be easily increased, for the Japanese Water Color Company lists a very large assortment of colors. If any great amount of work is contemplated it would certainly be advisable to secure additional colors, for then the work can go on unhampered. Of course, all other colors can be produced from the three primaries, but the work is much easier if an assortment of tones is at hand and need not be mixed. In addition to the fifteen colors supplied in the " complete edition " of Peerless transparent water-colors, the following extra films should be purchased to form a rounded-out palette:

Aureolin — a medium yellow
Brown madder — a red-brown
Burnt umber — a dark brown
Burnt sienna — a reddish brown
Cobalt — a medium blue
Cadmium orange — a bright orange
French blue — a deep blue
Indigo — a deep grey-blue
Oxide of chromium — a bright rich green
Light red — a brown-red
Indian red — a brick red

Rose madder — a bright purple red
Raw umber — a dark brown
Raw sienna — a light brown
Yellow ochre — an earth yellow
Vermilion — a light red
Vandyke brown — a deep brown

Or, if it is desired to purchase only the colors named above it will be found that these will cover about every requirement.

Now, how to mix the colors to get true tone value in the photograph. For reference purposes the following suggestions may be of interest.

Colors for Landscapes

A cool grey sky — Cobalt and vermilion
A cool grey sky — Cobalt and light red
A warm grey sky — Cobalt and light red with a touch
     of yellow ochre
A dark grey sky — Cobalt and indigo
A blue sky — French blue at the top, toning down
     through cobalt to a mixture of cobalt and ver-
     milion near the horizon
     French blue or cobalt, and oxide of chromium,
     with a touch of vermilion
Light clouds — Rose madder, Indian red or brown
     madder in mixture with cobalt or French blue.
Grass — Oxide of chromium and raw sienna
     Yellow ochre and French blue
     Burnt umber and French blue and burnt sienna
Sunlight on grass — Aureolin and oxide of chromium
Trees — Oxide of chromium and cadmium orange
     Oxide of chromium and burnt sienna in the darks
     Indian red and aureolin

Trunks of trees — Oxide of chromium and brown
  madder
Broken foregrounds (earth showing through) —
  Brown madder and yellow ochre
Roads and paths — Burnt umber, cobalt and oxide of
  chromium
    Warmer colors — Light red, rose madder, yel-
    low ochre, Burnt sienna, Vandyke brown
Red brickwork — Light red and burnt umber, with
  perhaps a little rose madder
Stonework — French blue and raw umber
    Yellow ochre and burnt sienna
Woodwork (such as gates, fences, etc.) — French
  blue and raw sienna
    Burnt sienna, light red and rose madder
Thatched roofs — Brown madder
    Burnt sienna and cobalt
Moonlight — Rose madder, French blue and oxide of
  chromium
Sheep in landscape — Rose madder, yellow ochre and
  brown madder
Cattle in landscape — Burnt sienna and brown
  madder
    Burnt sienna and French blue   .
    Rose madder, raw sienna and Vandyke brown
Horses in landscape — Burnt sienna and brown
  madder
    Burnt umber and brown madder

Examination of the reproduced prints published in
AMERICAN PHOTOGRAPHY shows that a large number
of marine photographs are taken, and these can be
worked up into beautiful colored prints. The tones of

blue, green and yellow to be found in water can be very successfully worked into a print, so for the benefit of those readers who have marine subjects in their collection of negatives, the following suggestions are given for coloring such tones:

Skies — See landscape mixtures

Very strong sky — Indigo, light red and yellow ochre

Tanned sails on boats — Burnt sienna and Vandyke brown

    Brown madder and Vandyke brown ·

    Light red and burnt umber

White sails — Yellow ochre

    Raw umber

Warm sandy beach — Raw umber and rose madder and a touch of cobalt

Rocks — Burnt umber and cobalt

    Burnt umber, French blue and oxide of chromium

Hulls of ships and boats generally have a light reflected from the water: touch this in with French blue

Hulls of tarred boats — French blue and brown madder, with a touch of oxide of chromium

Old timbers — Brown madder and cobalt

    Burnt umber and oxide of chromium

Strong darks in old timbers — Burnt sienna and French blue

Rust on ironwork — Light red with burnt sienna

A red always seen on the lower half of the hull of boats. This is the color of the anti-fouling paint. — Brown madder and light red.

Stormy waves — Cobalt and raw umber

Darker waves — Cobalt, raw umber and indigo

Green reflections under boats in sea water — Oxide of chromium, with sometimes a little raw sienna

Seaweed on rocks, timbers, etc. — Burnt sienna and oxide of chromium

Stone walls of quays — Brown madder and French blue

With these suggestions for mixing colors there is no reason why good colored prints should not be turned out. This list contains almost every condition that the colorist will encounter and if he will but use a little judgment and not apply the colors too strongly, the result is almost certain to be a brilliant piece of work full of good tone values and a credit to anyone.

FURTHER NOTES ON APPLICATION

Note the words *judgment* and *almost* in the previous sentence. Were it not for the personal element these would be superfluous. Judgment is necessary to guard the worker against mixing colors that will produce mud and applying these to the print. Keep the colors clear; use plenty of clear water for cleaning brushes and be very careful about dipping a brush charged with one color into another color. This is sure to result in degraded color. Better to use several brushes when working a number of color tones into one area, than to try to do the whole job with one brush.

Various tones of a color can be readily blended into one another by laying the several tones where they belong, using plenty of water, and then, while they are wet, with a brush charged with clear water, running the tones together. They will almost blend themselves and in the process will develop a number of additional tones that add interest and improve the result. Where additional accents of light or shadow are needed, use a stronger color and pick out the accents, being careful not to overdo the matter.

If the print was made slightly lighter than normal, it it possible to inject into the masses an amazing wealth of tone values. Take, for example, a tree or a grass-covered foreground. Many shades of green, blue, yellow, and sometimes even red, are found in these, and

the colored print can be greatly enhanced by placing these where they belong. Do not depend merely upon the recorded lights and shadows of the photograph to give the effect of modeling. Assist this record with color, for therein lies the secret of producing a brilliant water-colored photograph. Do not hesitate to give color to highlights, for in nature even these have color. For example, glass will reflect more and stronger highlights than any other subject, but these lights cannot be truthfully rendered by white paper. They contain color derived either from the subject itself or from the illuminant, and it is part of the colorist's work to give these lights an appropriate tone. Of course this tone will depend upon the mood reflected by the picture, and must be in harmony with the other colors.

This brings us to a consideration of composition. Slightly aside from this work, composition is nevertheless important, but cannot be touched upon here except to such an extent as it relates to color. Color composition and mass composition are rather different terms, yet they are closely related to one another in so far as the final result is concerned. Mass composition considers only the placing of the several pictorial elements to produce a unified whole. Color composition aims at the same objective, but it considers the proper color values necessary to secure unity. To be successful, a colored print must be correctly composed both as regards mass and color, otherwise it will not hold together. The picture that, because of faulty color composition, induces the eye to jump from one spot to another, certainly cannot be called a success. This lack of unity is caused by the creation of more than one point of interest through poor selection of tones, and is a pitfall that must be

studiously avoided. There is only one way to avoid it, namely — thought. Thought and study applied to the work before it is begun will forestall many errors resulting from hasty work. So don't be afraid to think.

Before leaving the subject of transparent water-colors for photographs and going on to more advanced work, let me just mention another color-medium that has recently been placed upon the market. This has worked out quite satisfactorily in cases where the attempt has not been too ambitious, and may be of some interest. The medium consists of water-colors put up in wood, like pencils. The pencils are supplied in twelve different colors and coloring with them is very easy. The pencil is merely rubbed lightly over the area to be colored and this is then washed with a brush full of clear water. The disadvantage of the medium is that it can be easily worked only on a paper with some " tooth," which eliminates the glossy and smooth papers. These pencils are manufactured by Eberhard Faber under the trade name " Mongol," and are procurable from most draftsmen's and artists' supply dealers.

To make the work of the first attempt at coloring easier for the beginner, let us take the example reproduced as Fig. 1 and proceed to color it. Such a subject could be *tinted* by using only a limited number of colors, such as — blue for the sky and water; green for the trees, and warm brown for the rocks, or it can be colored in detail by coloring every portion separately, such as the lights on the trees, the rocks and rock shadows, the patches of sunlight here and there, and so on. In every case it will be well for the beginner to apply weak colors and gradually build them up by successive washes until

Fig. 1

strength is attained. For the sake of ready reference the various areas to be colored have been numbered.

Color the sky first. Apply quickly a thin wash of rose madder along the horizon and over this a wash of light blue, covering the entire sky (7). Now, starting at the top, apply a second wash of the same blue and over this another, drawing each one down just a trifle more, so that when finished the sky will be a good bit stronger at the top than it is at the horizon. This change in tone produces the vaulted effect of a sky that can be procured by no other distribution of color.

A wash of light blue with a touch of red is applied to the distant mountain (1). This gives aerial perspective or depth to the picture and by proper choice of color these hills can be placed as close to or as far from the observer as the colorist desires.

Color the waterfall (3) with light washes of blue, green and yellow, run on in quick succession so that they blend evenly into one another. Pick out the shadows with deeper blue or blue-purple. The highest lights may be accented by an additional touch of yellow, sparingly applied.

The trees at the left of the picture (4) are in deep shadow, and a deep shadow will be noticed under the bushes at the right. Get a variety of tones in these areas, deep purples, deep blues, deep blue-greens and dark reds quickly applied in rapid succession, over one another, around one another, using plenty of water and allowing them to run together. Blend out any sharp tones, pick out the lighter areas and do not permit the area to dry until it is satisfactorily colored. The work should be done quickly, it should require no more time to execute than is necessary to read this paragraph.

The lighter tones in the trees (5) may be washed in with light green and with dark green and dark blue in the inter-leaf shadows. Run a wash of bright yellow over the sunlit leaves and tone this down with light blue.

Next in order are the rocks (2). These may be variously colored with browns and greens, with purples in the shadows. Brown may be made by mixing blue and yellow to produce green and then adding red until the desired color is obtained. This tone can be applied to those portions that are in a partial shadow, or half-tone, and the effect can be greatly enhanced by varying this tone slightly by successive washes in spots. The sunlit faces of the rocks can be colored with warm brown containing plenty of light yellow, but they should not be yellow. The shadows can be treated with a deep blue or deep purple over some parts of which is run a wash of green. Touches of green may be placed at other spots to give the moss-green effect so often seen on rocks in a stream. On the distant rocks around the waterfall run a lighter wash of purple, broken on the rock surfaces with warm brown. This will retain them in true perspective.

The water in the foreground and middle distance (6) can be made to reflect a wealth of color. Deep blues and greens are the predominant colors in the water, with dashes of deep purple, red and light green run in quickly, before the colors are set. Light tints of yellow, blue and green should be applied to the rapids, for they pick up reflections from the sky and surrounding objects.

The work is now almost completed, but a few little touches can be added that will improve the result. With a fine point apply minute spots of yellow to those leaves (8) that are in direct sunlight. Be careful not to overdo

this, for yellow is a strong color and too much of it will attract undue attention. Remember, the waterfall is the chief point of interest and nothing must be done that will attract attention from it. The picture must "hold together."

If desired, objects in the immediate foreground (9) can be made to stand out by outlining them with deep purple or deep blue, but this must not be overdone. And, also, it should be done on a fairly damp print so that the outline is not extremely hard.

This little outline of procedure will afford a starting point for the tyro and most of the washes are "flat." That is, the number of tones in each area is limited and not much modeling is required. As more work is done, additional tones can be added, or the colors can be changed to give the view an autumn instead of a mid-summer aspect, but these are abilities that accrue with practice. A subject similar to that illustrated can be made a thing of real beauty by following the outline above and using a little judgment.

TEMPERA PAINTING

So much for transparent water-color. We now come to another phase of coloring which is far more difficult to handle, but produces a vastly superior result. This is the application of "tempera" color to a photograph. When the work is completed the result is an actual painting with all trace of the original photograph obliterated. In other words, an opaque color is applied over the camera drawing and all modeling and perspective must be created by the artist. This naturally requires a well-considered color scheme evolved from considerable study and thought, but is an extremely valuable means of training one's color-sense.

The colors used can be exactly the same as those named for working in transparent colors, with the single addition of white. White is a "body" color, that is, it is opaque, and it is given color by adding to it solutions of the aniline films. Naturally the key of the color is raised by being thus mixed with white, but this merely means that enough color must be added to bring it up to strength. Any good, inert white, such as Johnston's Snow White (procurable from any photographic supply house) may be used for making tempera, or proper tempera colors may be purchased from artists' color-men. These are rather expensive, however, and nearly as good work can be done by mixing the colors as described above.

Work of this nature can be done both in oil or tempera, but tempera has so many things to recommend it that it is to be preferred over oil for the beginner. In its lighter tones it has the charm of pastel colors, and if properly handled can give almost the depth and richness of oil. Another asset is the fact that it dries very quickly. This is important when only a limited time can be devoted to the work. Furthermore, it is possible in this medium to secure a smaller spot or area of lovely color than can be obtained with oil, an important consideration in small pictures. The colors dry with clean, sharp edges that permit a smaller picture to be made than with oil. Most oil paintings must be viewed from some distance to obliterate the effect of raised surfaces, but not so tempera. When completed the picture is really a mosaic, but instead of pieces of colored glass the work is done in spots of exquisitely colored and beautifully shaped paint. Try to make each individual area of paint as lovely in form as possible. Try to give the impression that it was put on joyously, neither too thin nor too thick, yet unlabored.

An important element in securing this effect is to use the very best brushes obtainable. Red sable water-color brushes should be used, of course, but bear in mind that tempera is heavier than transparent water-color, and the brushes must have resiliency and spring. The hair should be of medium length. A brush with long hair will produce a faulty direction line and bend too quickly when applied to the paper, while a brush of short hair does not convey enough color and spreads too quickly.

Tempera is handled in much the same manner as oil, except that it dries slightly differently in tone from the way it is applied. Light colors as a rule dry deeper

than expected, and dark colors dry lighter. A second coat of any given color will dry deeper than the first, so that if it is necessary to patch up the work, or make alterations, a little more white should be added and the color tested until it dries to the same value as the original. Colors deepen on the palette if they stand for any length of time. If a color is applied one day, and some of the same color is saved and applied the next day, it will dry very much darker than the first.

Laying on a flat surface usually presents some difficulties to the beginner. Such a surface might be represented by a sky. There are several ways of handling this problem, but the only definite rule is: " Never stop the work until the entire surface is painted at one sitting." If a part of the area is covered and the remainder left until some later time, a distinct line of demarcation will be found between the first and second applications. A flat surface should be applied fairly thin, that is, just heavy enough to cover any silver deposit that may lie beneath. Start at one corner and with a weaving technique of brush strokes work down or across the surface. Go back and forth, smoothing, blending, keeping the edges wet, and work rapidly.

One very excellent sky treatment is by the use of broken color. Select first the shade of blue desired and then mix two or three other shades which, when applied close to one another, will approximate the color desired. These may be, say, a green-blue, violet-blue, plain blue and lighter tones of these three. Starting with one, the one that is to predominate, lay in this color, leaving a good bit of bare paper between the spots. Now fill in most of the areas between the first color, and finally, with the third color, close up all the gaps. Lighter tints are,

of course, worked in close to the horizon. If clouds are desired, these must be carefully planned and space left for them to be filled in later. Sky treatment by broken color has a distinct advantage over a plain tone, in that it results in depth and vibration that cannot be otherwise secured. Great care must be taken to assure absolute equality of value and brilliancy in the several colors, else the surface will dry streaked and spotty. However the work is done, be sure it is done with a finer technique than that used in the foreground, else it will push itself forward and destroy the perspective. Vigorous treatment may be used in the foreground, but there only.

Another point to remember in tempera painting is to use such forms as will obviate modeling as much as possible. Do not force this, but try to do it logically. Aside from color, the charm of tempera lies in its freshness, the result of direct painting, which can easily be lost by too much modeling. Rely rather upon cast shadows to throw objects in relief. Study shadow forms continually and when working out a picture try to make the shadows assume pleasing form and pattern. Remember that the medium in hand permits of any changes desired being made in the photograph, so, if the original was not entirely satisfactory, make corrections in the coloring. When modeling is absolutely necessary, add more water to the paint and work rapidly. As an extreme measure, when it is desired to do a great amount of modeling, a little glycerine may be added to the colors, but this must be used sparingly. It retards drying and permits greater delay in finishing.

Most beginners in tempera painting make the mistake of using colors too high in key. This results in a weak, chalky picture lacking depth and brilliance. A tempera

painting should be as heavy in tone as an oil painting, and the greater the gamut of colors it contains, the richer will be the effect.

It is of paramount importance that everything used in tempera painting be clean at the start and kept clean throughout the duration of the work. This applies to photographs, brushes, water and palette. Wash the print thoroughly, first with water, then with benzol and finally with Ivory soap. Allow it to dry thoroughly in a place free from dust, and, while working upon it, keep a piece of clean paper between it and the hands. Oil from the hands deposited on the surface will leave a spot difficult to cover. Change water frequently, and use two vessels, being careful to keep any trace of color out of the one containing clear water. Use the other to wash brushes, and wash these each time a change is made to another color.

For palettes, opal glass is as good as anything, or the china tiles sold for water-coloring may be used. Several of these, about 8″ by 10″, should be kept at hand, for when using a number of colors they will soon all be needed. One of these slabs should be used as a key palette on which is placed a quantity of each color, with white in the center. A good color arrangement is to follow the spectrum colors, violet, indigo, blue, green, yellow, orange and red, placing these along one side of the palette and on the other side a series of browns, yellows and black, for there are times in tempera painting when black is useful. Now, on a second slab, mix the colors to be used, taking them from the key palette and mixing them with a palette knife, exactly as oil-colors are mixed. Always mix more than seems to be required, for, should a color be exhausted in the midst of work, it is almost im-

possible to make another lot equal in color and value to the first. Mix all colors with the knife, even small quantities, and be sure they are well blended before applying them to the work. Never mix colors with the brush except in cases where not more than two or three brushfuls will be required. Be sure the palette is clean before mixing another color on it.

It is a very good plan to save any unused color and place it upon a reference slab. Then, if it is desired to make any later alterations or correct an error, these colors will be preserved for use, or for reference if mixing a new color. This is much surer than experimenting on the painting, due to the difference in drying of opaque colors. A small spot might be tried on the painting and seem quite all right, yet when the entire mass is painted in, it might easily be greatly off in color or value. All colors must be definitely established on the palette before they are painted on the work. A point of difference between oil and tempera is that, because of the fact that tempera colors are less brilliant than oil, a greater number of colors must be used.

Color rhythm can be very effectively applied to work in tempera. Most artists are familiar with the rhythm or movement across the picture or from top to bottom, but there is another subtle but equally lovely rhythm of color. That is, there is a color rhythm or movement from distance to foreground or *vice versa*. For example, take a red rhythm. It may appear in some distant spot in the picture as a pink lavender, move gracefully forward and appear again as a pink in the middle distance, suggest another move or rhythm and appear as rose and then, in the immediate foreground, appear as a brilliant red.

These color rhythms are important. They give the

eye pleasure, and movement can be directed at will.   By them the eye can be made to travel directly into a picture, tieing up one part with any other part.   Thus the motive of a figure can be suggested.   For instance, suppose an open landscape containing figures.   In the distance, by means of color, we suggest a field containing flowers. The figure, in the middle distance, carries something which by its stronger color suggests some of these flowers that have been plucked, while in the foreground are several other figures engaged in plucking brilliantly colored flowers.   Imagination supplies the theme — the lone figure has gathered some of the distant flowers and is now entering the field near at hand to gather more of them.   In such a way color rhythm can be made to serve and convey the thought of the painter.

When completed, photographs painted over in tempera may be given a brilliance almost equal to that of oil paintings by coating them with artists' picture varnish.

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CHAPTER XIII

PREPARATION OF THE PRINT FOR COLORING

Now that the three principal techniques of water-
color handling have been described, let us pause, before
taking up the next coloring methods, for some formulas
and necessary information concerning preparation of
the subject for coloring. All paper is more or less ab-
sorbent of liquids applied to it, but this absorbing power
varies in different papers. Photographic papers gen-
erally are less absorbent than plain papers, due to the
coating of gelatine, but even in these there is a difference.
Glossy paper, for example, has practically no power of
absorbing color, while others, such as Velour Black and
Wellington Extra Rough, take it up quite readily. The
latter paper, as pointed out earlier in this book, absorbs
thin liquid color so readily that great caution must be
exercised when working on it, or the color will be too in-
tense. But this difference in absorbing quality can be
compensated for to some extent, and the following for-
mulas and methods of handling are given so that the
worker can first prepare his print, thereby escaping
many of the unpleasant handicaps that will result from
efforts made upon unprepared paper.

Before doing any coloring upon a print it should be
mounted, either upon a permanent or a temporary sup-
port. There are several reasons for mounting, but the
chief is that it minimizes the tendency to get the hands on

the work. Then, too, it is very much easier to handle a print when it is firmly supported than when it lies loosely. Furthermore, it prevents curling, and *how* a print can curl when a large wash of thin color has been run on it. Really, it is very much of a nuisance and hard on the temper.

For mounting material the best thing to use is beaver board or three-ply wood boards if the prints are 8″ by 10″ or over, while under that size any good heavy mounting board will do. This should be not less than twenty-ply, for it will be found that even this has not sufficient strength to prevent all curl. In general it is best to use the heaviest mounting board procurable, and forestall later difficulties.

There are a number of good adhesives that can be used, most of them serving their purpose quite well. The writer's personal preference is for Higgin's Vegetable Glue, a thick white adhesive that sticks very well. Then there is Weber's Royal Paste, which is very good, and a number of others that could be mentioned, but don't attempt to economize by the use of poor substitutes. Paste is inexpensive and does an important job.

A paste brush of some sort is required, but this need not be expensive. The cheapest variety is not to be recommended, but a fairly good brush about one and one-half inches wide, set in rubber, and selling for about thirty-five cents, should be used. Such a brush will carry enough paste for a large print and is not too large for a small print.

A print roller is needed to roll the print into contact with the mount. The catalogues are full of these items and the selection will be left to the individual. Get one as large and as heavy as price will permit. A light roller

requires more strength to handle than a heavy one, and, when mounting a large print, size is of importance.

Paper towels or a substitute for these will be required to lay the print upon when pasting and then for laying on the face of the print when it is being rolled on the mount. Old newspapers can be used, but there is always the chance of ink being transferred to the print, which might prove difficult to remove. White blotters can be used, but they are expensive. All in all, paper towels are about as good as anything and are inexpensive.

The first decision to make before mounting a print is whether it is to remain upon the mount or whether, after the print is colored, it is to be removed from the mount. Every print that turns out well should be provided with a frame, so that the manner of framing will, to some extent, determine the answer to the mount question. Is it to be matted or framed close? Large pictures of vigorous subjects usually appear at their best when framed close, while small prints with much detail are usually matted. General practice is to mat prints colored in transparent colors and to close-frame those done in opaque color. Since this custom is in line with traditional art framing, there is no good reason for not following it.

The next questions are: Is the print to be mounted on the mat board, is the mat to be formed by the white margins of the print, or is it to be provided with a cut-out mat lying over the mounting board with the print between? If the first or second method is chosen, the print will need a temporary mount for coloring, while if the third method is used the mount can be permanent.

There are so very few cases where a print can be presented at its best by the first method of mounting that it really does not pay to use it. If dry mounting tissue is

used for mounting the finished print, all will be lovely, but this is the only successful mountant for this type of work. A wet adhesive requires much care in use, not to get any on the face of the prints, not to use so much paste that it is squeezed out at the edges, and still to use enough to hold the edges firmly. Then there is the question of procuring a mat board heavy enough to prevent curl in a large print.

The second method requires quite careful work during the process of coloring, so that the color does not run beyond the edge of the image and present a ragged line. And, too, the white margins of the print must be kept clean. Of course, the method permits of really beautiful results, especially if the image is rather small and the paper large. Then it can be embossed with a plate-sunk center, when it will present a pleasing appearance. But to work thus means that if the print image be of substantial size the paper must be quite large. This is expensive.

Taken all in all, the third mounting method can lay claim to so many virtues that it is usually the best. It is so flexible that anything whatever can be done with it. There is no need to be careful about getting paste on the print, for this can be wiped off with a damp cloth. The smallest sheet of printing paper that will contain the image can be used. The print can be mounted upon a board heavy enough to prevent curl, and no concern need be felt about lack of artistic appearance in this. Three-ply wood panels can be used for large prints and these, by the way, are most excellent. They may be purchased at nearly any lumber yard for about fifteen cents per square foot. Where work on large prints, say 16″ by 20″, is being done, especially if in tempera, this wood

should by all means be used. Prints permanently mounted at the start of the work can be framed close or matted, as desired, and the selection of mat material is almost unlimited. But more of mats and matting later.

Another ingenious mounting method that provides a pleasant working surface is to mount the prints on linen and then place this upon a stretching frame such as artists use for canvas. The method is as follows:

Stretching frames made of white pine or other soft wood are purchased in the same size as the print. Stretchers are made in most of the standard photographic sizes, such as 8″ by 10″, 10″ by 12″, 16″ by 20″ and so on, making them quite adaptable, and in sizes up to 16″ by 20″ cost sixty cents per set of four strips, including wedges. Assemble the frame and have at hand some small carpet tacks, a piece of good linen crash about two inches larger each way than the print, a hammer, a tray of water, a paste brush, paste, print roller and your print. Lay out the linen on newspapers and tack it down at the edges. Now coat it with a medium thick solution of paste. During this time your print, which should be made on single weight paper, is lying in the water so as to be perfectly soft. Now lay this face down upon paper towels and give it a good thorough coating of thick paste, taking care to work the paste in well at the edges so that these adhere firmly to the linen. When satisfied that enough paste is on the back of the print, lay it in the center of the linen and roll into perfect contact. Roll it hard, using plenty of pressure, so that some of the texture of the linen is embossed upon the print surface (this is the reason for using single weight paper). Now, working as rapidly as possible, lay the print and linen on the stretcher frame and tack along one side. Stretch

the linen as tight as possible with the hands and tack the opposite side, folding the edges over, of course, so as to tack along the narrow side of the frame. Turn the frame ninety degrees and tack the sides, keeping the print stretched taut. Use plenty of tacks close together, for they will all be needed when the print and mount start to shrink. If the work was correctly done you should now find that, because of the expansion of the paper, your print has been carried over the edge of the frame on each side, and this is desirable, for no part of the linen should show beyond the print edges. When this combination dries, it will be found almost as tight as a drumhead. Usually the stretcher wedges are not required, but if you find that the print is loose on the frame the wedges may be driven in and the print made taut. Properly done, this method of mounting presents a very sympathetic surface to work upon, and the texture of the linen creates quite a canvas-like effect. If a rougher surface is desired, mount on burlap or artists' canvas, following the same method. Pictures mounted in this way are intended for close framing, of course, but, if it is desired to leave margins of white paper to provide a mat, this can be done, although the effect is not so good.

Temporary mounting may be used when it is desired to do the final mounting by either of the first two methods named. To mount temporarily, the best mounting board is three-ply wood. Wet the print thoroughly by soaking in a tray of clean water, and then apply a narrow stripe of paste along each edge on the back of the print and roll into contact with the board, working outward from the center. This stripe of paste need not be more than a quarter of an inch wide, but in that space use plenty of

paste to assure perfect adhesion, or, as the print dries and shrinks, it will tear loose at the edges. Do not attempt to speed the drying. Paper shrinkage is so great that there is some risk that the paper may split, but this is infrequent. When it is dry, the print will be stretched very tight and most of its shrinkage will be gone.

When the print is exposed, allowance must be made for a decrease in finished size if temporary mounting is done, for after the completion of the coloring a knife is run along the inside of the pasted edge and the print cut out to free it from the board. Sometimes it is possible to run a thin sharp knife *under* the edge of the print, thereby cutting it free, without removing the edge, but it is not safe to depend upon this, especially if good paste has been used to do a *good* job.

Permanent mounting on cardboard can be done just as described for mounting on linen and with the same materials. It is well to leave a narrow margin of paper, which can be trimmed off or covered later, for it is sometimes desirable to extend the boundaries of the print, especially in tempera and oil painting. Nothing can be done in this direction when using transparent colors, however, for then the color must stop at the edge of the image. Prints mounted on thin cardboard are best left to dry under light pressure, for then the tendency to curl is reduced. If, after drying for a long time, there is still some warp left, it can be removed by gently working the mount in a direction opposite to the warp. Do not force this manipulation or the print will be torn loose at the edges, but gently bend it repeatedly and the warp will gradually be corrected, the print then lying flat. Or, if it is desired to do the extra work, warp can be entirely prevented by back-mounting, that is, by back-

ing the print with another piece of paper, such as good drawing paper, which has been soaked exactly as was the print. This scheme works very well with small prints on single-weight paper, and will positively eliminate all curl even when 16″ by 20″ prints on double-weight stock are mounted on thin board.

Now about preparing prints for work upon them. During the process of making and handling, the prints have acquired a film of grease from the hands. This must be removed, for every finger mark will present a difficulty when coloring is begun. First, after mounting the print, go over it carefully with a soft cloth moistened with water, to remove any paste that may be on the surface. Then mop it with a dry cloth and go over it again with benzol or alcohol (be sure to get benzol and not gasoline, for some gasolines contain oil). This will dry almost immediately. Follow this wash with one of Ivory soap, made up into a good lather, to finally remove any dirt that may be left. But, to make the color adhere firmly, one more wash is required. This may consist of any of the following:

> Le Page's liquid glue . . . . 1 part
> Water . . . . 20 parts

Apply with a tuft of cotton over the entire picture. Or:

> Glacial acetic acid . . . . 25% solution

The entire picture must be gone over. Or:

A piece of cotton or linen may be moistened, rubbed on a sheet of ordinary gelatine (procurable at any drug store) until enough has been absorbed, and this then applied to the entire picture. Or:

> Pure casein . . . . 1 oz.
> Borax, powdered . . . . 180 gr.
> Water . . . . 1 oz.

Mix the casein and borax in a dry cup, add the water, stirring into a paste, and then stir in two ounces of boiling water. Allow to stand twenty-four hours or squeeze through clean linen. Then mix:

Above paste	3 oz.
Alcohol	3 oz.
Glycerine	5 drops
Carbolic acid	5 drops

This formula provides an excellent size for pictures that are to be colored either in transparent water- or oil-colors, or in tempera or opaque oil-colors. Also it is a very good medium to use for mixing colors in tempera. Thus prepared, the print is ready for working up, but, as mentioned above, the clean surface must be kept clean.

CHAPTER XIV

COLORING PHOTOGRAPHS WITH PASTELS

Before taking up the matter of coloring and tinting photographs with oil-colors, let us examine several other methods that offer some interesting variations. The first of these is pastel. Pastel is of French origin and consists in drawing in colors with crayons of dry chalky character. The pastel artist usually works upon a low-toned paper or canvas that has been prepared by having had fine sand dusted on a tacky surface to provide a " tooth " that will grind the dry color from the crayon and retain it upon the working surface. It is capable of both transparent and opaque effects, both of which will be described, and both of which are pleasing.

To produce a painting in opaque pastel, the print upon which the work is done must first be mounted and then prepared. This preparation consists in giving the paper enough tooth to hold the pastel color. When dry, the print, which should have had only enough exposure to delineate the main masses, is first given a coat of white shellac. This should be quickly flowed on rather thin, so as not to conceal the image, and when nearly dry, at the point where it is good and tacky, the grain is dusted on. This grain may be any one of several things, such as dry Portland cement, marble dust, powdered glass or pulverized silica. Plaster of Paris has been used, but this is not as satisfactory as marble dust or powdered glass. Tie the dust up in a fine linen bag and by a bounc-

ing action over, but not touching, the print, lay a dust
film over the entire surface. Try to make this as even
as possible and stop the work at the point where the
photographic image is still just discernible. The main
features of the print will then be retained, but most of
the detail will have vanished. When the shellac is
thoroughly dry, bounce the print several times on its
edge to remove excess powder, and it is then ready for
coloring.

Coloring in this case will proceed in almost the same
way as with tempera, that is, by building up form and
perspective through color values. Pastels are not very
expensive, so get the best you can afford. Meng's pas-
tels, of German manufacture, are among the best. They
should be purchased in the " soft " grade, for these con-
tain nearly pure color, and the same crayons can then be
used for transparent pastel painting.

An extended palette of pastels will include about the
same colors as were enumerated for water-color paint-
ing, but this can be limited if desired. The following,
at least, will be needed: cobalt, white, grey-blue, violet,
purple, Prussian blue, light red, vermilion, yellow ochre,
burnt umber, burnt sienna, raw umber, raw sienna,
black, olive green, Hooker's green, light blue, orange,
deep red, Naples yellow and crimson lake. Working
tools consist of several stumps (French being the best),
an eraser of kneaded rubber and a small chamois. The
first two items may be purchased from dealers in art
material, and the chamois may come from the " dime "
store. Select a small soft skin, for this is the most con-
venient to use and produces the best results.

Now, with your mounted and prepared print before
you, study it carefully to determine at the start the color

scheme you wish to use. In any kind of painting, including pastel, perspective and modeling are the result of the combination of two factors, color and detail. As a view recedes into distance, details disappear and colors change. Thus, by manipulation of these two factors, pictures are given perspective, or depth. For that reason the distant mountain in the water-color outline was colored blue or purple, and our strongest colors were used in the foreground. So, with this in mind, plan your color scheme to get these two requirements. Bear also in mind the foregoing advice that your picture must " hold together." Establish in your mind's eye the location of each area of color, so that when they are applied the picture is not " jumpy."

Pastel is very fragile, that is, the colors are easily rubbed off the paper, so do not touch colored areas unless deliberately to remove color. This feature of pastel constitutes almost its only possibility for correction in case of error, for changes are not easily made. Once color is applied, a part of it is there to stay, so be very careful as you work. Be sure the color you are ready to apply is the one to use. In other words, " Be *sure* you're right, then go ahead." Another possibility for correction lies in the fact that one color can be rubbed on over another color, thereby producing a mixture, but this is a limited possibility in colors of high key. If a spot is too dark, it can be lightened somewhat by rubbing white over it, or by rubbing it out with stump, chamois or eraser. There is some danger in doing this, for if an eraser is used too vigorously, it is apt to destroy the dust that was placed on the paper and then the color will not adhere. The fragile nature of pastel almost necessitates that the work be done on a vertical easel, to avoid touch-

ing it. It can be worked in a horizontal position, but the tendency to get the hands on it is so great that it is not safe. Another advantage of the easel is that the loose powder rolls off the work instead of remaining, as it will when horizontal. If this loose color remains it is sure to be mixed with other colors subsequently applied and result in degraded tones.

So many things can go wrong in opaque pastel painting that this medium is considered one of the most difficult to handle. On the other hand, it is capable of such lovely results that anyone interested in color can certainly get some pleasing effects with it. The colors can be made to give either soft or hard results, they can be subdued or brilliant as the artist desires, and can in every way interpret faithfully the thought of the user, limited by his ability to express himself graphically.

To secure soft, subdued effects, the colors are first applied lightly and then rubbed down with chamois or stump to the desired tone. Highlights may be picked out with the kneaded rubber worked into a point, or with a piece of soft bread used in the same way, or they may be placed in the picture with a light tone of pastel crayon, which is later worked down with stumps to blend the edges. Heavy, brilliant effects are secured by " loading " or " painting direct." That is, the colors are not stumped after application, but are left full strength. One color is applied over another to get tone variations, and the paper is loaded with all the crayon it will hold. Both methods of treatment are in use and both find favor, although the former is generally used for portraits in preference to the latter, because this work requires blending and softening to get the multitude of tones found in the skin.

Now let us examine the procedure necessary to get transparent tones with pastel. The beginner may find that coloring with pastels is easier than with water-colors, for it is easier to blend them. Furthermore, the colors can be made brilliant or they can be subdued to give a mere suggestion of color, although this practice has not much to recommend it.

Practically the same tools and colors as previously named are used, but the colors are applied differently and upon a different surface. For preparing the print the following medium will be required.

Potassium carbonate	20 gr.
Beeswax	½ oz.
Water	2 drams
Spirits of turpentine	2 oz.

Melt the wax on a water-bath. When melted stir in the carbonate dissolved in the water. Remove from the stove and add the turpentine. While still warm pour into a wide-mouth bottle and keep tightly stoppered. The correct mixture should be about the consistency of cream. If too thick add more turpentine, a little at a time. Use the spirits of turpentine prepared for artists.

A palette of sorts will be required for working colors. A china plate will do, or an old negative that has been cleaned of emulsion (to clean a negative, place it in a hot twenty-five per cent acetic acid bath and let it soak). If clear glass is used, a sheet of white paper should be pasted on one side.

Now take the pastel crayons you wish to use and scrape off a quantity of powder. Moisten this with some of the medium before starting work. Apply your colors with a piece of fine linen stretched over a stump, or with absorbent cotton wound around the end of a pointed

stick. Large areas of color may be handled with a tuft of cotton held between the thumb and forefinger, or the finger tip may be used. Fine details can be put in with a small brush. The method of application really does not matter much. The thing that matters is getting color where it belongs. If too strong, rub down with stump or linen. Details can be picked out with a pointed stick, such as a meat skewer, around the point of which is wrapped a piece of linen dipped in turpentine.

Choice of a suitable print for transparent pastel coloring rests upon the worker. If his artistic ability is equal to the task of creating at least a part of his effect through proper selection of colors, then the print may be held light. But if not, if he must rely entirely upon the photographic image to provide modeling, the print should be nearly full strength. Work upon such a print, however, can never produce a result even approximating the brilliance of a carefully colored weak print. The highlights and half-tones in a full-strength print will reflect far more color than will the shadows, so if the lighter portions are brilliantly and strongly colored, *body* color is required in the shadows, else they will be flat and lifeless. Shadows in nature are not flat, even by moonlight. A tropical sun produces the most vivid contrasts imaginable in daylight, yet the shadows have life and color. Therefore, when a picture is colored, the shadows must be given their appropriate hues or we will not be representing nature.

The print, then, should not be over-contrasty, or too much work will be required in the shadows. Select for coloring such negatives as contain a long scale of tones, and retain these tones in the print. Expose upon a sheet of soft paper, velvet or smooth, but do not use the extra

rough stocks or those with an embossed pattern of any kind in the paper base.   These are beautiful papers, but their texture does not lend itself to pastel ·coloring. Velour Black White Platinum Matt represents about the limit in surface texture, while such papers as Cyko Professional and Royal Bromide (Eastman) have surfaces that work splendidly.

If it is found that some portion has been over-colored, a part of the color can be removed by rubbing down the area with a tuft of absorbent cotton, or all of the color can be removed by going over the print lightly with cotton moistened in benzol or turpentine.   This, of course, clears the print of all color and medium, which leaves you with a clean print upon which to start coloring anew.   If your first attempt is not satisfactory, wash off the color, reprepare the paper and make a fresh start. Keep in mind the defects that occurred in the first attempt and try to correct them in the second.   You will no doubt turn out not one but many colored prints that are not good, but Rome was not built in a day.   An artist who has been painting for over forty years once told the writer that if he painted six canvases and got one good one out of the six he felt he was doing very well.   So, if a trained painter who has spent a lifetime at art is satisfied with sixteen per cent of perfection, what should a beginner expect?

In closing the section on pastel coloring, be reminded again that opaque pastel is very delicate.   Handle such paintings carefully.   No fixatif has yet been made that will hold heavy pastel work satisfactorily.   Yes, fixatif can be sprayed upon it, but it will hold only the very thinly-colored parts.   Fixatif is nothing more than a very thin varnish.   The chalky character of pastel

makes it absorbent. Also, it is flat, that is it has no lustre. If enough of this thin varnish were used to firmly bind the color, so much would be needed that the picture would be glazed over with varnish, thereby destroying the character of the medium.

If a pastel painting is to be transported, the only safe way to do so is by placing it on a board larger than the painting and cutting out of thick board a mask larger than the image. Lay this mask over the print and tack the two together so they cannot shift, then place over this a second board as large as the first, fastening the whole combination together.

As regards preservation of a pastel, the only safe place is under glass. Of course, you may not wish to frame all of your pictures, yet may wish to keep them, in which case a portfolio might be made up along the lines given for transporting. Not many pictures could be placed in one book, because of the weight of the boards, but several books might be made if there are many pictures. Rest assured, however, that unless given adequate protection, pastel paintings will not long retain their beauty.

CHAPTER XV

COLORING WITH WAX CRAYONS

Not to be seriously considered by anyone interested in the best of coloring that can be applied to a photograph, yet capable of producing tints, are the ordinary wax crayons, or " Crayola " used by school children. These may be purchased for a few cents for the smaller boxes, up to twenty-five cents and more for the larger. These larger boxes contain quite a number of colors, which, by judicious use, can be used for tinting photographs.

Aside from the crayons, the only other tool needed is an old handkerchief. The operation is simple. Rub the desired color-crayon lightly on the print, then rub it down with the handkerchief. In this way the crayon can be rubbed down to an even tint and the colors can be nicely blended. But really there is not much to the process or its results so far as artistic merit is concerned and it certainly would not afford much interest to those seriously engaged in coloring.

CHAPTER XVI

Coloring with Oil-Colors

All of the color mediums thus far described have limitations that hamper their use. This is not true of oil-colors. With them anything can be done that is possible with the others, plus things peculiar to oils alone. For instance, water-colors are not nearly as intermiscible as are oils. Certain water-colors when mixed produce only mud, the pigment separating out to form a sludge. Care must be exercised to avoid this. Furthermore, if water-colors are not properly handled, they will dry spotted, show hard lines and be full of streaks. Tempera-colors require a wide range of tones to produce a brilliant picture, and they cannot be modeled to any great extent. Pastel is rather difficult to handle well and is very fragile. But none of these handicaps apply to oil.

True, improper color mixtures will result in degraded tones, the mixed paint may be muddy, but very rarely will it be of such nature that it cannot be used by changing the tone by adding another color. There is no precipitation, as with water-colors, nor do oil-colors dry streaked or spotted if pure colors are used. Yet, if one color is applied with a brush charged with another color there is every possibility that there may be streaks, but this can be easily corrected by cleaning the brush and applying fresh paint. Oil-colors do not require as many tones to produce a brilliant result as do tempera-colors, for the inherent nature of oils is to produce a brilliant

picture. Oil-colors are not fragile. After a painting is dry it can be handled freely without fear of rubbing off the paint.

Any painting technique whatsoever may be employed at the will of the artist. The picture may be done in either a high or a low key, the brush technique may be bold and vigorous, or it may be soft and smoothly blended. Regardless of the method of handling, the result will always be the same, a picture of good color and great richness, for these are the qualities of oil-paint.

Certainly a far greater number of colors, tones, shades and hues can be produced with oil-colors than with any other medium, due to the fact that more colors can be freely intermixed without producing unusable color. For example, it is a very common practice in oil-painting to mix as many as five, and sometimes six colors, to produce just the right tone. This would be next to impossible with water-colors, because of chemical reaction, although it might be done with tempera, but not with the same richness of result. Also, it is not necessary to mix nearly as great a variety of colors for oil-painting as are needed with tempera, since a quantity of paint can be very easily changed from one tone to another. Again, if but a few brushfuls of a color are needed, it can be instantly mixed on the palette with the brush, and the work go on without interruption. Of course, when large quantities of a color are needed it is advisable to mix it on the palette with a knife, for then the actual painting will progress more rapidly. This statement does not mean that any one area should be completely covered with the same tone or color, for no such area exists in nature. The subject of color-change in an object has been discussed earlier in this volume and the suggestions there

given apply to oil-painting. The monotony of a uniform surface must be broken by changes in color, or it will lack interest and will be a false representation of facts.

Take, for example, a clear blue sky. This is, in all probability, the largest unbroken area which one will be required to paint, and to paint it well is no mean test of the artist's skill and color judgment. While discussing this same subject under tempera painting the suggestion was made that it be treated by the use of " broken color." Depending upon the painting technique employed, this same treatment can be applied to an oil painting, if the entire picture is similarly handled. When using the " broken color " method, paint is applied very heavily, with a full brush, the brush being freshly charged at each stroke. This technique results in a painting built up almost like a mosaic, with highly raised spots of paint that look amateurish, crude, rough and very " modernistic," if the painter fancies that type of work. But it is not taking full advantage of the possibilities of oil-colors. Harmonies are destroyed by reason of the fact that the colors are not properly tempered. High-spots are produced that catch the light and present a series of disturbing reflections.

A painting based on a photograph can hardly do other than follow the methods of the realists, those artists who strive to secure the effect of realism, an accurate translation of facts, in their pictures. They take full advantage of their medium, its flexibility, its sensitivity, its ability to record truthfully, under skillful handling guided by natural good taste, endeavoring to place upon their canvas a realistic picture of the subject. Accuracy does not mean that every blade of grass, every leaf or twig, every cloud or tree or bush must be painstakingly de-

lineated. For such definition we would use a photograph. But it does mean that colors must be accurately seen and truthfully painted where they belong. It means that a high regard must be entertained for proportions. And, furthermore, accuracy means that subjects which by nature are of smooth texture must be painted correspondingly. The subject which formed the basis of this digression, a clear blue sky, has no texture. It is a void. Therefore, ask yourself this question: " Can a subject lacking in texture be truthfully represented if the representation bristles with texture resulting from heavily applied gobs of paint? " You may draw your own conclusions.

Two of the outstanding features of oil-colors as compared with any other medium are their sensitivity and the ease with which the paint can be modeled and blended. Sensitivity means the extent to which the medium is responsive to the artist's touch, the degree of ease or difficulty experienced in securing those slight changes of tone so prevalent in nature and so necessary to realistic painting. Oils are extremely sensitive. Modeling and blending refer to those qualities of a medium that render possible the gradual changes in tone or value which indicate the shape of a subject. An example of this might be the same clear blue sky, or an iron cylinder, or the well-filled sail of a boat. Realism in these subjects can be beautifully achieved by using the full blending and modeling quality of oil-colors. But it is very doubtful if these same surfaces could be satisfyingly rendered by " direct " painting, as its champions call it.

Now, on the other hand, there is another pitfall that must be avoided. The above discussion of heavy painting may create an impression that oil-colors should not

be thickly applied. Such an impression would be in error, for oils *must* be heavily applied if the true oil-painting quality is desired. Thin painting must be avoided. The finished work must appear solid, an effect that can be secured only when there is a strong, heavy film of paint on the work. This may seem contradictory to the foregoing statement concerning heavy paint. The difference lies in the fact that when paint is applied heavily and then properly blended, the work is being done correctly to produce a realistic effect. A clear blue sky is not blue in all sections. As the eye follows downwards toward the horizon a change will be noted. This change is from blue to blue-green, and on some days the green may be very strong. At the same time there is a change in value, the lower portions of the sky being weaker than the zenith. Close to the horizon there may be another change in color and value, for nearly always in temperate climates there is a strip of blue-grey or very pale violet along the horizon. These changes are so extremely subtle that they are barely perceptible, yet if each section is examined separately they are clearly discernible. So smooth is the transition from one to another that it would be a hopeless task to attempt to paint them directly with paint mixed on the palette. Of course the painters who work that way do not attempt to catch those delicate modulations of color, which accounts for the appearance of their work. To transfer this change to the work the paint must, in a sense, be mixed on the canvas. This is done by blending. Approximate as closely as possible the color required by mixing a quantity of paint on the palette, then apply it to the canvas. Study the subject and the work, determine the place where colors change, then blend, add white or color as

required, and work the area into a unified whole. Done correctly, this technique will result in a realistic painting. But be sure to use plenty of paint and oil. Dry paints, that is, those lacking in oil, cannot be smoothly blended, nor can an insufficient quantity of paint be blended. It may look quite all right when wet, but when dry it will look thin and lack richness.

Perhaps a few suggestions for mixing colors will not be amiss. All of the pure colors called for in the following list of mixtures will be found in the list given later. These suggestions are not by any means a complete list of colors available from the list of pure colors, but will afford a starting point for the colorist. The figure indicates parts of each color to be used.

American Beauty — bright bluish-red: 2 alizarin crimson, 2 cobalt violet, 1 zinc white

Blossom — delicate light pink: zinc white, a touch of Indian red, a touch of Venetian red

Brick red — deep orange-red: Venetian red

Cardinal — bright rich red: 8 alizarin crimson, 2 cadmium orange, 1 zinc white

Coral — light orange-pink: 30 zinc white, 1 cadmium orange, 1 cadmium lemon, 1 Venetian red

Garnet — deep red: 8 alizarin crimson, 2 zinc white, 1 cadmium orange, 1 ivory black

Claret — deep purple-red: 2 burnt sienna, 2 alizarin crimson, 1 cobalt blue, 1 zinc white

Flesh — pale yellowish-pink: zinc white, a touch of raw sienna

Mahogany — reddish-brown: 3 Indian red, 1 Venetian red

Old rose — dull rose-pink: 20 zinc white, 1 burnt sienna, 1 Indian red

Orchid — light pinkish-lavender: 20 zinc white, 3 alizarin crimson, 1 ivory black

Raspberry — dull purple-red: 10 zinc white, 3 alizarin crimson, 1 burnt sienna, a touch of Indian red

Rich maroon — rich dark red: 3 burnt sienna, 1 Indian red

Rose — pale rose color: 15 zinc white, 1 raw sienna, 1 Venetian red

Salmon pink — pink tinged with red-orange: 7 zinc white, 1 raw sienna, 1 Venetian red

Scarlet — brilliant red: 2 alizarin crimson, 2 cadmium orange

Strawberry: 6 zinc white, 6 alizarin crimson, 1 Indian red

Terra cotta — brownish-orange: 3 burnt sienna, 1 Indian red

Antique ivory — delicate yellow: 50 zinc white, 1 cadmium lemon, 1 cadmium orange, a touch of cobalt blue

Chamois — pale greyish-yellow: 9 zinc white, 1 yellow ochre, a touch of ivory black

Gold — lustrous golden-yellow: 2 yellow ochre, 1 zinc white, 1 zinc yellow

Golden rod — bright yellow: 12 cadmium lemon, 1 cadmium orange

Jasmine — medium yellow: 40 zinc white, 1 cadmium orange, 1 cadmium lemon, a touch of cobalt blue

Lemon — bright yellow: cadmium lemon, a touch of zinc white

Primrose — pale yellow: 60 zinc white, 1 cadmium lemon, 1 cadmium orange, a touch of cobalt blue, a touch of ivory black .

Sunlight — pale pink-yellow: 4 zinc white, 1 raw sienna

Light blue — pale green-blue: 30 zinc white, 2 cobalt blue, 1 emeraude green

Delft blue — medium greyish-blue: 16 zinc white, 8 cobalt blue, 1 ivory black

Electric blue — cold greenish-blue: 3 emeraude green, 3 cobalt blue, 1 zinc yellow

French blue — medium green-blue: 2 zinc white, 2 cobalt blue, 1 emeraude green

Iris — delicate green-blue: 24 zinc white, 1 cobalt blue, a touch of Indian red

Lucerne blue — medium lavender-blue: 15 zinc white, 1 ultramarine blue, a touch of ivory black

Lupine — light blue: 8 zinc white, 1 cobalt blue, a touch of Indian red

Marine — dark blue: 4 ultramarine blue, 2 zinc white, 1 ivory black

Midnight — dark blackish-blue: 2 ultramarine blue, 2 ivory black, 1 zinc white

Navy blue — dark blue: 7 cobalt blue, 1 zinc white, 1 ivory black, a touch of Indian red

Robin's egg blue — light greenish-blue: 6 zinc white, 2 cobalt blue, 1 zinc yellow

Royal blue — deep blue: 9 ultramarine blue, 7 zinc white, 1 ivory black

Sapphire — deep pure blue: 2 cobalt blue, 1 emeraude green, 1 zinc white

Sky blue — pale greenish-blue: 30 zinc white, 2 cobalt blue, 1 emeraude green

Turquoise: 4 cobalt blue, 4 zinc white, 2 zinc yellow

Apple green — yellowish-green: 10 zinc white, 4 zinc yellow, 2 emeraude green, a touch of Venetian red

Bottle green — dark green: 4 cobalt blue, 1 zinc yellow, a touch of ivory black

Emerald — rich, vivid green: 2 emeraude green, 2 zinc yellow

Evergreen — dark green: 4 emeraude green, 1 zinc yellow, 1 ivory black

Jade — yellowish-green: 23 zinc white, 2 emeraude green, 2 cobalt blue, 2 zinc yellow

Lettuce green — medium yellow-green: 5 zinc white, 2 emeraude green, 1 zinc yellow, a touch of ivory black

Metallic green — olive green: 3 cadmium yellow, 1 ivory black

Moss green — yellowish olive green: 3 cadmium lemon, 2 cadmium orange, 2 ivory black

Ocean green — pale yellow-green: 20 zinc white, 1 emeraude green, 1 zinc yellow, a touch of ivory black

Olive green — yellowish-green: 6 cadmium orange, 1 emeraude green, 1 ivory black

Sage green — greyish-green: 12 zinc white, 4 emeraude green, 2 zinc yellow, 1 ivory black, a touch of Venetian red

Sea green — pale yellow-green: 20 zinc white, 1 emeraude green, 1 zinc yellow, a touch of ivory black

Burnt orange — medium red-orange: 6 cadmium orange, 2 zinc white, 1 Venetian red

Golden poppy — bright orange: cadmium orange pigment

Indian orange — bright red-orange: 7 cadmium orange, 1 alizarin crimson

Maize — pale yellow-orange: 40 zinc white, 1 cadmium orange, 1 cadmium lemon, a touch of cobalt blue

Maple orange — pale yellow-orange: 5 zinc yellow, 2 yellow ochre, a touch of burnt sienna

Peach — pale orange-pink: 50 zinc white, 1 burnt sienna, 1 cadmium orange

Amethyst — bluish-violet: 3 zinc white, 3 cobalt blue, 2 alizarin crimson

Heliotrope — purple-blue: 5 zinc white, 2 alizarin crimson, 2 cobalt blue

Hollyhock — brilliant red-violet: 25 cobalt violet, 5 zinc white, 2 alizarin crimson

Lavender — pale lilac: 30 zinc white, 2 cobalt blue, 2 alizarin crimson, 1 ivory black

Mulberry — dark reddish-purple: 2 cobalt blue, 2 alizarin crimson, 1 zinc white

Plum — dark purple: 6 cobalt blue, 4 alizarin crimson, 4 zinc white, 1 ivory black

Purple — pure purple color: 5 cobalt violet, 1 cobalt blue, a touch of ivory black

Violet — bright purple: 6 cobalt violet, 1 cobalt blue, 1 zinc white

Wistaria — grey-purple: 4 ultramarine blue, 4 zinc white, 1 Indian red

Autumn — deep golden-brown: 2 yellow ochre, 1 burnt umber, 1 burnt sienna

Bronze — lustrous green-brown: 5 cadmium orange, 1 ivory black, a touch of Venetian red

Brown — color of scorched wood: 3 burnt sienna, 3 yellow ochre, 1 cobalt blue

Chestnut — deep yellow-brown: 3 raw sienna, 2 cobalt blue

Cinnamon — deep brown: 2 yellow ochre, 1 burnt umber

Gold brown — brown of golden hue: 4 cadmium orange, 1 zinc white, 1 Venetian red, 1 ivory black

Leather: 3 burnt sienna, 2 yellow ochre, 2 zinc white, a touch of ivory black

Negro — deep brown: 8 zinc white, 3 burnt umber, 4 yellow ochre, 1 ivory black

Nude — very pale warm tan: 10 zinc white, 1 yellow ochre, a touch of burnt sienna, a touch of burnt umber

Seal — very dark brown: 10 burnt umber, 2 yellow ochre, 2 ivory black, 1 burnt sienna

Tan — warm light brown: 8 zinc white, 1 yellow ochre

Tobacco — deep brown: 2 yellow ochre, 1 burnt umber

Steel blue — dark bluish-grey: 6 zinc white, 1 ivory black, a touch of ultramarine blue

French grey — grey with a rose undertone: 30 zinc white, 1 burnt umber, 1 cobalt blue

Horizon — light bluish-grey: 60 zinc white, 1 ivory black, a touch of cobalt blue

Mist — whitish-grey: 50 zinc white, 4 emeraude green, 1 Venetian red

Pearl grey — pale bluish-grey: 10 zinc white, 1 burnt umber

Nickel — lustrous grey: 50 zinc white, 2 yellow ochre, 1 ivory black

Silver — pale lustrous grey: 30 zinc white, 4 emeraude green, 1 Venetian red

Slate — dark bluish-grey: 2 zinc white, 1 ivory black, a touch of ultramarine blue

Smoke — dull grey: 2 zinc white, 1 ivory black, 1 burnt sienna

Taupe — dark warm grey: 3 zinc white, 2 ivory black, 2 burnt sienna

Zinc — medium grey: 50 zinc white, 3 yellow ochre, 1 ivory black

Although artists' colormen list an enormous number of colors put up in tubes and known as pure color, it will not be necessary for the colorist to purchase all of these. The following list of twenty colors, which includes white, contains every pure color that will be

needed to mix any tone, tint, shade, hue, or value desired, regardless of subject. Some of these colors are rather expensive, particularly cobalt violet, but if the work is being done with any view to permanency, *good* colors are the only safe kind to use. Cheap colors are gummy or too thin. They lack body, dry into degraded colors and are very fugitive. It pays to buy good materials for art work as well as for photography.

· These twenty permanent colors may all be freely mixed with one another without fear of subsequent change. They have been selected for permanency, strength, and free intermiscibility to form a well rounded-out palette.

Alizarin crimson	Ivory black
Burnt sienna	Light red
Burnt umber	Raw sienna
Cadmium lemon	Raw umber
Cadmium orange	Ultramarine blue
Chinese vermilion	Vandyke brown
Cobalt blue	Venetian red
Cobalt violet	Yellow ochre
Emeraude green, or	Zinc white
Transparent oxide of chromium	Zinc yellow
Indian red	

It may be noted that a rather popular color, Prussian blue, has been omitted from the list. This color is quite safe when used alone, but is uncertain when mixed with other pigments. Chemical reactions are likely to result from certain mixtures, which render Prussian blue fugitive, and for that reason it is not included in a list of permanent colors. Zinc white is preferable to white lead, because the latter pigment is also subject to chemical change. Sulphurous gases so prevalent in city atmospheres combine with the lead to form lead sulphide,

a brownish-yellow lead salt that will considerably alter the tone of a picture painted with white lead. Zinc white is a pure carbonate of zinc less subject to change and therefore more stable in color.

Some of these colors can be used for transparent oil-coloring, but they are not made for that purpose. If the colorist wishes to color photographs in both transparent and opaque oil-colors and does not care to make the outlay for a set of colors suitable for each technique, then he would be well advised to stick to the above list and use such colors therefrom as are found by experiment to be suited to transparent work. No white will be used, of course, the light tints being secured by rubbing down stronger color, and then most of the colors listed can be made transparent if used thinly. Or, if the colorist so desires, he can secure proper photo-oil-colors from any photographic supply house. There are several brands of colors available prepared especially for photo-coloring, Kodak, Peerless, Marshall's, and Roehrig's being the most generally known. The Japanese Water Color Company, makers of Peerless Transparent Photo-Oil-Colors, list sixty standard colors, but most of them will not be needed even for the most ambitious work. If the colorist sticks to the list given above he will find that it contains every base color needed to make any intermediate required, and he will not be burdened with excess tubes of color. The list contains only permanent colors, which, if purchased from a reliable source, will always be true to color, pleasant to work with, and entirely satisfactory.

Prints intended for transparent coloring need no treatment prior to coloring, unless it is desired to mount them. This need not be done to prevent curl, for photo-

graphs colored with transparent oil-colors do not curl as do those colored with water-colors. If the print was dried flat it will remain so during and after coloring regardless of whether it is mounted or not.

When a photograph is to be painted over entirely with opaque oil-colors, it will be necessary to mount the print before doing any coloring. The working surface must be firm while the work is being done, and it must be adequately supported to retain its beauty after completion. Oil-paintings become quite hard and brittle when dry and they must be handled accordingly. The mount should be fairly heavy, as indicated in the section on mounting. When mounted, the print must be given a coat of white shellac to keep the paint from sinking into the paper and presenting a dull appearance. While the work is in progress the print may be placed directly on the easel, or it can be tacked to a small drawing board, which will provide a firmer support.

Each color medium requires its own peculiar accessories for application and control of color, so for transparent oils the following will be required:

Palette — a piece of glass or a china plate

Palette knife — the work will be facilitated if this tool is provided for mixing colors

Brushes — transparent oils, being light in weight, do not require heavy brushes, especially since very little brushwork is done. One No. 00 and one No. 2 red sable round water-color brush will serve quite well

Meat skewers — about one dozen should suffice

Absorbent cotton — a small roll

Linen or cotton rags

Benzol

Thinning medium — supplied with the paints

Accessories for opaque oil-painting:

Palette — a regular artist's palette with thumb-hole. May be either oval or square in shape

Palette knife — this item is essential. The French pattern with a knee is preferable to the straight variety

Brushes — No. 1 Bright's Bristle Brush
No. 3 Bright's Bristle Brush
No. 6 Bright's Bristle Brush
No. 10 Bright's Bristle Brush

Benzol

Poppy oil

Retouching varnish — to provide a temporary protective coating to recently painted pictures

Dammar varnish — to provide a permanent protective coating. Should not be applied to a painting less than six months old

Easel — work in opaque oil-colors demands this item, since the medium cannot be worked in a horizontal plane, as can transparent oil-colors

While working opaque oils it is essential that the painter frequently retreat several paces in order to get a comprehensive view of his work. At close range there are so many distracting details in an oil painting that it is impossible to see exactly what each color will look like when placed beside another color. Then, too, part of the beauty of any painting lies in the fact that at a distance the tones blend into one another and the brush-strokes are lost, thereby smoothing out the unevenness that detracts from a painting viewed at close range. Regardless of the medium, no painting larger than 5″ by 7″ should be viewed at a range closer than four feet. If the painting is large, say 16″ by 20″ or more, seven to eight feet is the better viewing distance. Of course, there are exceptions to this rule. For example, the student may be studying a painting to learn how the artist handled his brush to secure effect. Usually artists de-

velop a brush technique that is peculiar to individuals, sometimes so characteristic as to be a means of identification. Then it is necessary to examine the work closely, perhaps even enlarged, to learn just how the particular bit was done.

Other paintings are done in a very fine technique, using small brushes, and containing a wealth of detail. Usually such work is of small size. If this were examined at any great distance, most of the masterly handling of minute details would be lost. Modern work, however, is not usually of this kind. It seems that most of the modern painters are in so much of a hurry to get the work finished that they cannot stop long enough to include even some details that should be included. Most of this work must be viewed at more than the prescribed distance.

Transparent oil-coloring consists in merely laying a thin film of pigment on the photograph by means of swabs of cotton or brushes and then rubbing this down with clean cotton to the desired color. The actual application of transparent oil-colors is as simple as watercolors. With your color scheme decided upon, start working at the upper left-hand corner, as far as practicable, and carry the work from there, to avoid touching finished parts of the work. Usually this corner will consist of background or sky. Put this in first and finish it before going further. If you run your background color over other portions of the print let it go for later removal. Get in all the main color areas first and let them overlap a trifle, as it will do no harm, and may create some interesting effects. When working-in a background, vary the tones. The same tone carried over a large background is monotonous and lacks interest.

Select a base color that will harmonize or contrast your subject, and then mix several shades of that color and break up the area with them. Do the same with any other large areas. Nature does not color any area entirely with the same tone, so why create a fictitious note by doing so on a print? The only way to avoid monotony in coloring is to inject a variety of colors and tones of colors into the work. A tree is not the same shade of green in sunlight and in shadow. A green lawn is broken up by various shades of color. The sea has many moods, each one of which reflects its peculiar colors. These are not all the same blue or green or grey. Fabrics are portrayed by the manner in which they reflect light and color, so none of these can be truthfully rendered by presenting the same color throughout. Nor can the photographic modeling be depended upon to portray all these nuances of light and shadow. The photograph must be assisted by proper colors, for then only can a brilliant result be expected.

Usually transparent oil-colors are applied to the print by stumps formed of small wads of absorbent cotton wrapped around small pointed sticks, such as the meat skewers mentioned. This is for rather small details. Large areas are best put in with a wad of cotton held between the fingers. Mix the colors to the desired shade on the palette, dip the wad of cotton into this, taking up a small portion of paint, and rub it on the photograph. If the color is too strong, take a piece of clean cotton and rub the color down to the desired tint. Or, to avoid applying the color too strongly in the first place, rub some of it out of the cotton on a piece of paper before touching it to the work. Put in as many areas as possible in this way and then take the small stumps and work

out details. If a spot needs lightening, rub it down with the point, or if not dark enough, go over it again with the same color or a shade of the same color. Values can thus be reduced or increased easily at will. Places where two colors have overlapped can be very nicely blended down so that one goes smoothly into the other, or, if the stump be dampened with benzol, a sharp line can be produced.

Portraits can be very beautifully colored with oils, and some hints for work on these are contained in the following. Colorists differ in opinion as to the best way to start coloring a portrait, so that perhaps there is no "best" way. A method that has always worked out well in the personal case of the writer has been to color a part of the background first, working up close, but not entirely to the figure. Then start coloring the figure, face first, and follow this with the hair, hat and drapery. The principal point to bear in mind is that as many colors as possible should be put in where they belong, not necessarily toned to their final appearance. When an artist starts work on a canvas, he first draws in roughly with colors the main areas of his picture, so that there are some colors on the canvas. Working upon this color base, he builds up details and forms according to the picture he has in mind. He thinks of the picture as a whole, not as a collection of individual details, for only by seeing it as a whole with the main areas blocked in, can he form a comprehensive mental image of the completed work. Colors are peculiar in their relation to one another. Each separate area of color is affected in value by the one next to it. For example, red standing alone on a white ground is a strong color, yet when this same red is painted on a yellow-green or a blue-purple it is weak, as there is a decided loss of contrast. Con-

versely, yellow on white is weak, yet painted beside red or dark green it will stand out brilliantly. So, the reason for getting in as many colors as possible at the start is to enable the artist to see quickly whether his preconceived mental color scheme is going to harmonize or clash.

When these main areas have been painted in, follow with the details and final blending and softening of the colors. Starting at the face, finish this to the point where the shadows are to be put in and then do the hair. Color the hair to the desired shade with cotton stumps and then with a small brush gently stroke it in the same direction as the hair lies. Properly done this will impart to it a lifelike sparkle that is far superior to the flatness resulting from the use of unaided color. If the colorist is especially adept, he can take a tint of lighter color in a very fine brush and accent the highlights, *sparingly,* or with a darker color accent the shadows. But the brush-strokes must always be in the direction of the hair.

Hats are variously treated according to their nature. Felts usually require little more than an even tone slightly darker in the shadows and slightly lighter in the lights. Make the colors assist the modeling, for a life-like painting. Rims of hats and under-brim sides are frequently assisted by detailing with blue in the shadows, but the use of this color must be determined by the subject. A blue tone over shadows makes them more transparent, especially if little details are picked out in them to break the monotony. Straw hats may be very effectively colored by applying appropriate tones and then detailing the ribs in light tones for highlights and dark tones for shadows. The lines must not be continuous, for their purpose is merely to suggest texture and not to force it upon the viewer.

Lips, eyes and cheeks will require some special and

rather painstaking care to handle pleasingly, and may provide more discouragement than any other part of the picture. Color the cheeks with a deeper red than that used for flesh and then blend it very, *very* smoothly into the surrounding color. Use a small stump or a small brush and get the color right. Use a brush to apply a proper color to the eyes, and be careful to keep color out of the whites. With your finest pointed brush place the catchlights, with white toned down with a little yellow or blue, and with the same brush treat the lashes and brows as described for the hair. Color the lips with the brush, then go over them with a stump to work the color down to its final tone.

Next proceed with the drapery. Here again blues and purples can be used in the shadows, and subdued whites in the lights. Such accessories as beads can be beautifully modeled by accenting the shadows with brush strokes that follow the shape of the subject and then adding brilliant highlights where these occur. Edges and folds in drapery can well be accented in light tones, and shadows in dark tones, but this must be done with artistic judgment.

The main subject thus acceptably colored, continue the work with the background. If the above suggestions have been followed, you will now need only to bring the background color up to the subject, and the work will be completed. Bringing up the background may not be without its difficulties, for it is easy to carry the color into parts where it does not belong, thereby spoiling the work. But if done carefully it should not be much of a problem. Using a brush charged with background color, carefully outline the subject in a rather broad line. Then, with the stump used for applying the first background color,

but with no more paint added to it, work up to this line. Now, with a clean stump turned into a fine point, work along the line and soften it into the background, and the job is done.

Some professional photographers are now showing beautifully lifelike oil-colored miniature portraits that are an excellent imitation of genuine hand-painted miniatures. They are supplied in glass-covered gold frames contained in plush cases, exactly as miniatures are made up, and present a very pleasing appearance if well colored. And, too, they command fancy figures. Most of the color work on these follows the general lines mentioned above, but, of course, the detail is much smaller. These prints measure about two by three inches or smaller, and include only the head and a small part of the torso, with just enough background to throw the subject into proper relief. They are colored with a combination of opaque and transparent colors — opaque for the background and transparent for the subject. When working on them, proceed as above until the background is reached and then mix white with the colors. It is especially important here that the background be broken up into a number of tones, while at the same time a pleasing effect can be created by stippling. Lay in all the tones, covering the whole ground, and then with the brush held vertically impart to it an up-and-down motion, going over the entire surface. This will raise little spots of color that add interest and break up what might be a monotonous treatment.

Landscapes and marines are far easier to color than are portraits. Also, one may take more liberties with them. But this liberty should not be carried too far. Either transparent or opaque colors may be used, or a

combination of the two can be used if so desired. Certainly this combination will result in a more realistic appearance than the usual job turned out by photographers who color pictures merely by tinting them with thin, washed-out tints. The photograph upon which the work is being done will be the deciding factor as regards detail. Most pictures will contain foreground detail that can best be rendered by drawing it in boldly with the brush, while, as the view recedes into the distance, color values change and detail becomes more confused, finally blending until it is lost entirely. This quality is called aerial perspective and is the quality that gives depth to a view. Distant mountains are blue or purple, depending upon the light, shadows should have a bluish cast, and if the subject is brilliantly lighted the shadows will be very blue. If the colorist feels that he is enough of an artist to do the work, he can paint the entire picture in opaque colors as was outlined under tempera painting. All that is necessary is to mix white with the colors and then apply them to the picture. When the painting is finished, it should be allowed to dry in a warm place for about two weeks and then be given a coat of retouching varnish. This will increase the brilliance of the colors and provide a protective film to the paint. No dryer of any kind should be used with the paint, the only thinning medium being poppy oil. This results in a slow-drying paint that will require at least two weeks to dry thoroughly, hence the period named above.

With the description of oil-coloring photographs the methods of hand-applied colors are brought to an end, but there are still several coloring methods that may be interesting, so these are included here briefly.

CHAPTER XVII

CHEMICAL COLORING OR TONING

Prints can be toned by the reaction of certain inorganic compounds on the silver image, the result being a monochromatic and not a polychromatic print, as is the case with hand coloring. The range of colors that can be secured in this way is very limited, so another method of securing a similar result has been evolved, in which a greater range of toned or dyed images may be secured. Basic dyes are used and the reactions are carried out in two steps. Certain inorganic compounds, such as ferrocyanides, have the property of separating a basic dye from its solution and attaching it to themselves, which is chemically known as mordanting. So, if a silver image is transformed into one composed of silver ferrocyanide, this new compound will react with the dye to form a similar image of the dye color.

The formula for the mordanting bath is:

Cupric sulphate .... 154 grains
Potassium citrate .... 460 grains
Glacial acetic acid .... 230 minims
Water .... 12 ounces

The copper salt used must be pure and free from iron. Dissolve, and add just before use:

Potassium sulphocyanide .... 154 grains
Water .... 4 ounces

Use one volume of the last with three of the first solution.

Another formula is:

Uranium (uranyl) nitrate ...	120	grains
Oxalic acid	60	grains
Potassium ferricyanide	60	grains
Water to make	32	ounces

For use take:

Stock solution	1	part
Water	4	parts

These solutions should be stored in well-stoppered brown-glass bottles in the dark.

Depth of tone depends upon the length of time the mordanting bath has been allowed to act. Short immersion results in weak tones, while fully bleached prints will dye up to the full strength of the dye. Too long immersion is detrimental. At the first appearance of a slight brown tone remove the print from the bath, for if mordanting be carried beyond this point inferior tones will result. Now wash the print until the highlights are free of yellow stain, which will usually require ten to fifteen minutes. In any event washing should not be prolonged more than twenty minutes, or some of the mordant will be washed out. Following washing, the prints are immersed in a dye solution made up as follows for all dyes except methyl violet:

Dye	3	grains
Acetic acid, 10%	1¼	drams
Water to make	32	ounces

Methyl violet will require only 1½ grains of dye in the above formula.

The depth of the dyed image may be controlled by the time of immersion. A short immersion gives a weak image and a long immersion a strong image. Follow this

with a good washing until the whites are clear, or if trouble is experienced in securing clear whites, use of a very weak ammonia solution (three drops to sixteen ounces of water) will clear them. This acts very energetically and the prints should be washed thoroughly the instant the whites are clear.

The following dyes are suitable for dye-toning:

Safranine A .... Red
Chrysoidine 3R .... Orange
Auramine .... Yellow
Victoria green .... Green
Methylene blue BB .... Blue
Methyl violet .... Violet

Toning prints with the inorganic chemical compounds is another method of securing colored photographs, but these processes are too involved to be taken up here. For full information concerning them the reader is referred to " Photographic Facts and Formulas " or " How to Make Prints in Colors," both of which are published by the American Photographic Publishing Company.

CHAPTER XVIII

COLORING LANTERN SLIDES

Although the application of color to photographic prints will afford endless hours of entertainment, and enhance the beauty of numerous prints, the advantages of color are by no means confined to those limits. Despite the popularity of amateur cine outfits, there are still thousands of lantern slides being made for educational and entertainment purposes. Some of these are used in their black-and-white state, but many of them are colored. Making lantern slides presents no difficulties that cannot easily be mastered by anyone familiar with printing negatives on paper, for all operations are identical, the only difference being in the fact that the slides are on glass and are projected onto a screen for viewing, instead of being viewed directly by reflected light. Just as enlarging on bromide paper reveals many beautiful details of the negative that are concealed in a small contact print, so projection of a slide on a screen discloses even more of the negative quality. Any negative that will make a good print will make a good lantern slide, though the negative should be as free as possible from any defects, such as pinholes, stains, etc. Small spots that might not be noticeable in a contact print may show up plainly on the screen, hence any retouching, spotting or the like must be done most carefully. Every effort should be made to produce slides as nearly perfect

as possible and every bit of skill and care exercised to that end will find its reward when the slide is viewed on the screen.

As regards the technicalities of lantern slide making, it will not be necessary to go into this here. There are available numerous books that go into the subject very fully. Our purpose is only to give hints and suggestions for coloring slides, not for making them.

Generally speaking, the art of coloring slides is not materially different from that employed in coloring prints on paper. The same rules governing cleanliness apply to slides and the work is done with the same colors (except as later noted) and brushes. When the beginner looks at his first slide and notes the small size of its areas as compared with an enlargement on paper, he may experience a faintness of heart. These areas do appear extremely small. They make one wonder whether the slides really can be colored in a way to present a pleasing appearance on the screen. Be assured that they can be, with just a little practice. When some experience has been acquired, the colorist will no longer think of small spaces to be colored. As a matter of fact, the spots that at first seemed mere pin-points now assume a quite sizeable appearance, permitting the painting-in of two or three tones to increase the interest. Large areas, such as skies, which in the first few slides seemed relatively large, now begin to present difficulties in the way of securing smoothly blended tones of several colors to achieve a realistic result. Other troubles arise when an effort is made to paint in clouds in a " bald-headed " sky. This requires skill that comes only with experience, so it should not be attempted on the first few tries. Be content at first with a sky of normal greenish-blue, be-

coming higher in key as it approaches the horizon, perhaps with a thin strip of pale lavender or light rose at the horizon.

Assume that several acceptable slides in black-and-white have been made. You wonder whether they are suitable for coloring. The slides should be thin, but full of detail, though the exact degree of density will depend upon the quality of color required. One method of working is to make a slide in which the shadows are just a little weak and then build up with color to secure the necessary contrast. The other way, which, incidentally, is usually more satisfactory, is to apply weaker color to a shadow of normal depth on the slide. This method does not leave the way as wide open to error as does the first, since there is less need for exercise of personal judgment in contrast values. The question might here be asked, why is the strength of color estimated in the shadows? Well, since the silver deposit is heaviest in the shadows, those sections will naturally transmit the smallest amount of light to the screen when the slide is projected, therefore the screen will be black or dark grey in shadow areas. It has been pointed out previously that if there is enough light to record an image on the photographic negative, there is color in the shadows. This color must be applied to the slide, which in turn will transmit it to the screen, else we would not have a realistic picture. As the shadows are dark, they will require stronger color, if it is to make itself evident on the screen, than will the highlights, where there is almost clear glass. So, if the shadows in the slide are of such density that they will permit the passage of sufficient light to display the applied color, then the highlights and middle tones will also transmit their color. In other words, shadow densities

determine the degree of color strength necessary to register properly on the screen.

The emulsion on lantern slides is peculiar in that it exhibits a rather marked tendency to repel the color, especially if the slides have been fixed in a hypo-alum fixing bath. Slides so fixed should be immersed in a two per cent ammonia bath for two or three minutes and then rinsed well before coloring. Be sure that all ammonia has been washed out of the emulsion before coloring, for ammonia has a tendency to bleach the colors.

If the colorist is doing his own slide making he would be well advised to use a plain hypo solution containing two and one-half per cent of sodium bisulphite. When working on slides so fixed, if the gelatine shows a tendency to soften because of warm weather or the heat of the illuminator, the slides should be bathed for two or three minutes in a two per cent formalin solution and rinsed before coloring.

After the slides are washed, but before draining, they should be very carefully swabbed with a tuft of absorbent cotton or a soft camel's hair brush to remove grit and dirt. Then stand them on a rack to dry, or, if the work of coloring is to be started at once, they may be left lying in a clean tray of clear water. Never touch the gelatine surface with the finger, because this leaves spots of grease that will repel color.

Coloring may be done on either a wet or a dry slide, each system having its adherents. The beginner may find that his colors blend more smoothly on a moist surface, so he will probably prefer that. However, if the work is of long duration, the chances are that most of the contained moisture will have evaporated some time before the work is completed, and there is small chance of

again moistening the slide without removing at least part of the color. If a weak light that generates little heat is used under the coloring desk and the work rapidly executed, it is quite possible to keep a moist surface on which to work.

Until only a few years ago most lantern slide coloring was done with transparent water-colors. These are still the favorite, although some artists are now using dyes dissolved in alcohol, such as Gypsy dyes. Others use such mediums as Rit, Diamond and other package dyes that are sold commercially, while still others use the recently marketed Mongol colored pencils previously described. In fact, any transparent color that can be made into liquid form and applied with a brush can be used. Even transparent oil-colors can be used when thinned with poppy oil or light drying oil, and there is no question of their being permanent. The disadvantage of oils is that they require a very long time to dry, so they cannot be used on work that must be delivered in short order. The only requisite, then, is that colors for slide coloring be transparent. Gypsy dyes probably offer the greatest opportunity for extremely brilliant colors, when such coloring is desirable. They are exceptionally transparent, even when color is applied eight to ten times. They are freely intermiscible, do not throw down a precipitate, except in a few rare cases, and by the addition of thinner can be made to produce soft effects, as well as brilliant ones. Because of the highly volatile solvents used, including alcohol, amyl acetate, butyl acetate, etc., they dry very quickly, affording little opportunity for blending. This means that the colors must be exactly right before they are applied to the work, else the result is hopeless, for there is small opportunity to correct errors.

Package dyes and Mongol pencils are both prepared in the same way. Quantities of the desired dry color are dissolved in sufficient water to make the color strength required. This liquid color can be made up in saucers, water-color glasses, evaporating dishes or any form of receptacle that is conveniently at hand. A very excellent color cup may be purchased in the five-and-ten-cent stores. It is nothing other than the small clear glass cup used under the legs of furniture to make it slide easily and prevent marring floor coverings or floors. These cups are made of heavy glass, are smooth and easy to clean, hold a large quantity of color, are inexpensive and heavy enough not to tip over easily.

The favorite colors, in use by most artists, are transparent water-colors. These are conveniently available in two brands, Velox Transparent Water Colors, made by Eastman Kodak Company, and Peerless Japanese Transparent Water Colors, made by the Japanese Water Color Company. Both brands of color are put up in convenient form, the actual pigment consisting of a thin form of water-soluble paint applied to a paper base. For use a slip of this paper is cut from the sheet and immersed in water until the color is dissolved. The paper is then removed and the color solutions are ready for use. They blend well, in only a few cases forming a precipitate, and the user will soon learn to avoid such mixtures. Their only disadvantage lies in the fact that if they are applied too strongly they tend toward partial opacity. This is true only when colors of extra strength are desired, so does not occur in the usual run of work. The assortment of colors available in the Velox brand is rather limited, but the Japanese Water Color Company list a very large assortment of colors. Almost any color contained in a list of artists' water-colors can be found

in their list, and the colors run quite true in hue and value. A novice starting to color lantern slides will find in the book of Velox colors or the Complete Edition of Peerless colors enough selection and variety to carry him along until he becomes proficient, at which time he can invest in a larger palette of color films if he so desires.

Brushes are the next consideration. Repetition of an earlier statement will do no harm here. Good work demands good brushes. The brushes supplied with some color sets are not good for our purpose. To begin with they are made of camel's hair; then they are poorly made, the ferrules are loose on the handles, the hairs fall out and they do not form a good point. Camel's hair, even in a well-made brush, is not sufficiently resilient to do the work required of it when coloring lantern slides. The brush for this work must shape itself to a fine point. It must spring back to its natural shape after application to the work. Pleasant working requires that the ferrule be fastened firmly to the handle, and that the brush does not lose hair. It should not be so pliable as to bend too quickly when applied to the work. The specification that the brush have a fine natural point does not mean that it must be a small brush. Well-made brushes of red sable, which is the only satisfactory hair for water-color brushes, will shape up into a beautiful needle-point in any size. When the area is fairly large, the full working power of the brush can be used, when it is small, only the point will be in service. Lantern slides contain no really large areas, but they do contain endless small spots. So, if one good brush, such as a Weber " Fielding " No. 5, is purchased, it will serve for coloring the entire slide. A brush of this kind is expensive and deserves the care that would be given any other piece of

expensive equipment. A few simple don'ts for the care of brushes have been set forth before. Look them up and care for your lantern slide coloring brush according to those rules.

The selection of colors to purchase will, for obvious reasons, be left entirely to the user. He alone knows the amount of money he is able to invest in his hobby. As far as quality is concerned any one brand is about on a par with any other. As stated previously, one of the brands has a far greater number of colors available than has the other, a factor that might be of moment when making a selection. If the colorist wishes to make use of the suggestions for mixing colors given earlier, some of the colors not included in the Complete Edition will be required. Even those included in that edition are designated by names other than those used by artists when referring to a color of the same hue and value. It would, therefore, be advisable, if such a book is purchased, to procure a color card of artists' water-colors and by comparison with that rename the transparent colors with their correct names as found on the color card. Then reference can be made to any one of a number of published color-mixing guides and the correct base colors used to secure the desired mixed color.

Apart from the materials and equipment named above, one more very important accessory should be provided. That is a coloring desk of some sort upon which to work. Some artists work by holding the slide in the left hand in front of a sheet of white paper upon which falls a light, but this scheme is rather awkward until considerable skill is acquired. It is better to rest the slide against some inclined solid support at which one can sit to work comfortably.

The desk consists merely of a piece of glass, say about ten by twelve inches in size, one edge of which rests on a sheet of white cardboard, to one end of which is glued a narrow strip of board to keep the glass from sliding, the other edge being supported by several books to form an inclined plane of about thirty degrees. Under the glass lies a frosted white ten-watt electric light bulb on the end of an extension cord. A light of this size will provide quite sufficient illumination for any coloring on a slide of correct density, and it will not generate enough heat to be noticeable on the glass.

If many slides are to be colored at one time the worker may find his eyes suffering from continued exposure to the light under the glass. This is most annoying and can be very easily corrected by pasting a sheet of tracing paper on the under side of the glass. The illumination may thus be decreased to such an extent that a light of greater strength will be required. Increasing the amount of light also increases the heat, which is undesirable. To obviate all of these difficulties a little accessory was built with most gratifying results. It cuts off all extraneous light, permits the use of the smallest possible light bulb, keeps the fingers off the slide and allows the slide to be turned to any angle to secure the most advantageous working position. Made entirely of cardboard and glue, it can be easily, quickly, and cheaply built and serves its purpose splendidly.

The entire appliance is shown in detail in Fig. 2, the dimensions for the base being given for a 10″ by 12″ desk. The outside dimensions may be varied to suit the builder, but all other dimensions have been worked out for perfect functioning and should be followed in construction. There is nothing at all complicated about the

Part A
Required

3¾"
Cut out
7"Dia.

Part B
Required

4"
Cut out
3¾"
7½ Dia.
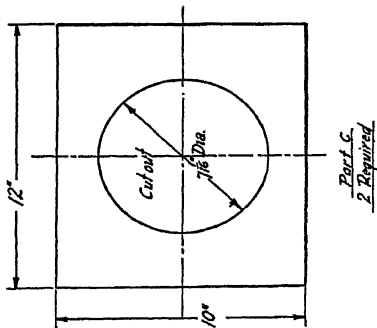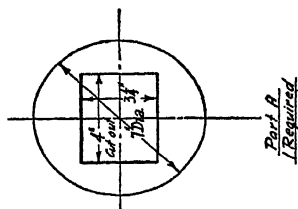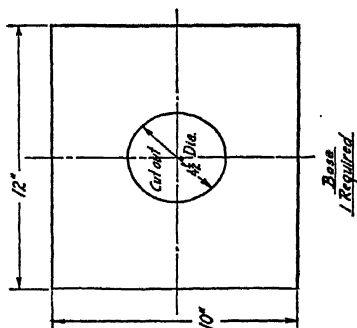
Material - ⅛" thick cardboard

¼" clearance for free rotation of Part A and B
Slide rests in this space?

Part A Part B Part C

Base

The Base and the two sections of Part C are to be glued
together to form one piece.
Parts A and B to be glued together to form one piece
This section rests in the cut-out circle of Part C.

ENLARGED CROSS-SECTIONAL ASSEMBLY

12"

Cut out
4⅝ Dia.

Base
1 Required

10"

12"

Cut out
7½ Dia.

Part C
2 Required

10"

Fig. 2

job and if dimensions are followed it should present no difficulties.

Retouching stands, which fold up compactly, can be secured from a photographic dealer. These can be easily adapted to lantern slide coloring, as they have an adjustable sliding shelf across the ground glass which can be masked down to the lantern slide size.

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CHAPTER XIX

COMPOSING LANTERN SLIDES

When the slide is satisfactorily colored it may be left to dry and then bound up with a cover-glass according to general practice. Binding includes two operations, namely, binding and masking. Masking is as important as coloring and binding, for by the mask the *picture* is made. Masking lantern slides corresponds to trimming paper prints with a view toward presenting the best compositional result.

Masking or trimming should be in mind when the slide is made. If only a very small area of the negative contains the only *picture* thereon, then that section only should be shown. Very frequently a 2″ by 3″ negative contains two or more separate compositions. That is, the complete negative may not be a good composition because it contains two points of interest, each trying to take the attention of the viewer, with the result that the eye jumps from one to the other and finds rest nowhere. Yet, if each of these points were considered separately either one or both might produce a pleasing result. On the other hand, another negative might well contain a pleasing composition hidden carefully away in a mass of distracting detail that diverts the eyes from the main subject. Neither of these negatives would present a pleasing picture on the screen, but they can both be trimmed, or masked, so that the result is pleasing.

Before starting to make the slide, carefully study a

contact print or an enlargement of the entire negative and determine the lines which should bound a pleasing composition. Then, with those dimensions determined, enlarge or reduce the usable area to fit the slide. If the section is large enough (not more than two and three-quarters by three and one-half inches) to allow of contact printing, this may be done. If it is larger it must be reduced; if smaller it should be enlarged to the dimensions given. All picture areas on slides of a series should be of nearly the same shape and size, to present a uniform appearance on the screen.

When the correct dimensions have been ascertained, lay them out on a sheet of black paper large enough to cover the entire negative, cut out the desired portion to produce a mask, and print the negative through this. Then, when the slide is ready to be bound, cut the binding mask just slightly smaller than the image so no clear glass shows between image and mask. Or, if ready-cut masks are purchased, the slide image may be made slightly larger to accomplish the same result. This method of working will assure the largest usable image on each slide. Slight changes in shape may be necessary but usually the boundaries can be extended a trifle to make all slides of a series the same size. The result is well worth the effort when the slides are projected. When once the eye has accustomed itself to seeing an area of one size and shape on the screen it is very much better to continue with that same size and shape than it is to change to another.